

MODERN Machine Shop

"ROCKWELL"*
...to be sure in
Hardness Testing

● Look for the name WILSON on the hardness testers you are planning to buy. It's your guarantee of the finest. WILSON makes—

"ROCKWELL" Hardness Testers

"ROCKWELL"
Superficial Hardness Testers

TUKON
Microhardness Testers

ACCESSORIES

Write for information today

**Trade Mark Registered*



J-MODEL
"ROCKWELL"
Hardness Tester

ACCO



WILSON

MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

230-G Park Avenue, New York 17, N. Y.

there's extra precision in the **ASSEMBLY** of every Heald machine

for Heald's skilled craftsmen
know that this means
more and better production for YOU!

There's one thing that goes into the making of a Heald machine that can be measured — even with the most precise testing instruments. That's the skill and experience of the men who build it.

Take the complex and intricate assembly operations, for example. They require the steady hand and trained eye of a master craftsman — the manual skill that comes only with years of experience. And these Heald craftsmen know the importance of doing every job well. There can be no compromise with quality — no short-cut to perfection. For Heald puts this extra care into every Bore-Matic and Grinding Machine to make sure that it will give extra precision and higher sustained production for YOU.



A skilled Heald craftsman assembling the large center work-head unit for a duplex internal grinder.



*Heald machines speed
the nations production*

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

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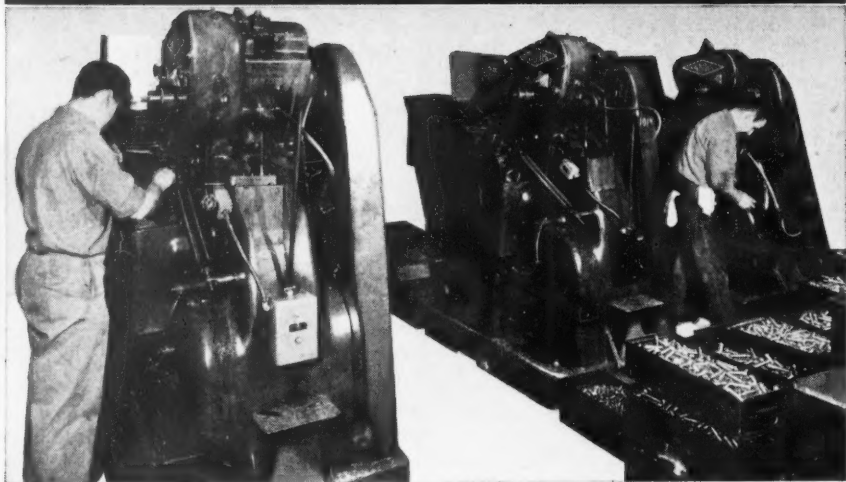
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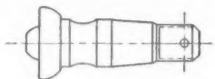
LANDIS "AUTOMATIC"

PROVED BY PRODUCTION...



Points and Threads 1020 Ball Studs per hour

Through the use of LANDIS Automatic Forming and Threading Machines, a large manufacturer has solved his problem of mass-producing certain automotive parts.



The workpieces are cold-forged blanks, from which ball studs are made. Specifications require a 45° point and a 9/16" 18-pitch N.F. thread cut to a length of 5/8". In constant daily operation is a battery of LANDIS Automatic Forming and Threading Machines, each of which point and thread 1020 pieces per hour. Four hours of production are obtained between each chaser grinding, resulting in low tool cost and minimum machine down time.

Because of their universal features, LANDIS Automatic Forming and Threading Machines are adaptable to mass-production operations on a wide range of automotive parts. By means of pick-off speed change gears, the machine cycle can be varied to accommodate any combination of thread length, pitch, and thread diameter, within the capacity of the machine—therefore this machine is adaptable to a wide variety of work. Hopper feed and automatic operation throughout enable one operator to keep a battery of machines in constant production, while set-up changes, of all types can be made in minimum time.

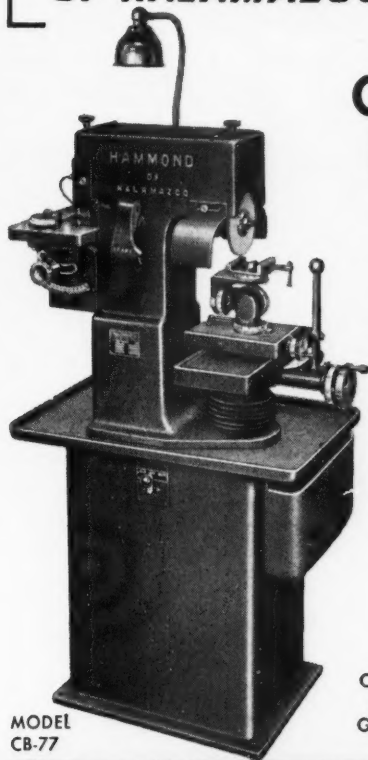
Can you revolutionize your pointing and threading operations with LANDIS Automatic Forming and Threading Machines? Please give specifications when writing for complete information.

LANDIS Machine CO.

WAYNESBORO
PENNA., U.S.A.

AN OUTSTANDING LINE

Hammond
OF KALAMAZOO

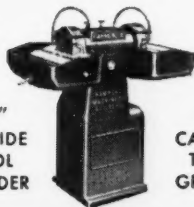


MODEL
CB-77

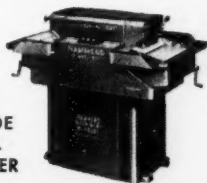
CARBIDE TOOL CHIP BREAKER & DIAMOND FINISHING GRINDERS

The Hammond Model CB-77 Chip Breaker and Diamond Finishing Grinder is a rugged performer in Hammond's outstanding line of Carbide Tool Grinders. More Hammond Carbide Tool, Chip Breaker and Diamond Finishing Grinders are being used today — in more plants than ever before — to grind Carbide and High Speed Tools easily, accurately, better. Hammond offers "America's Most Complete Line" of Carbide Tool Grinders . . . Wet or Dry operation.

10"
CARBIDE
TOOL
GRINDER



14"
CARBIDE
TOOL
GRINDER



Hammond Machinery Builders
INC.

1615 DOUGLAS AVENUE

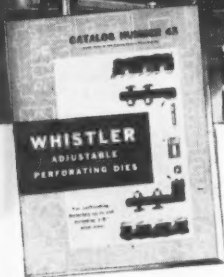
KALAMAZOO, MICHIGAN

*Get into Production in a few hours
with*

WHISTLER ADJUSTABLE DIES



Whistler Adjustable
Perforating Dies are
in use everywhere...
working in both large
and small presses.



There are plenty of other advantages in using Whistler Adjustable Dies. It makes sense to get the complete story. And it's easy to do. Write for your Whistler Catalog today.

Whistler perforating dies now offer a double-barreled advantage in getting into production faster. Standard sizes of round hole punches and dies... $\frac{1}{32}$ to 3"... can be shipped promptly. Special shapes... squares, ovals, rectangles, group and notching dies, are quickly made to order.

Equally important, set-ups are simple... take only a short time. Same units can be rearranged or units added in setting up different jobs. Production is thus speeded while die costs are amortized through continued re-use. No special tools are needed. All parts are interchangeable. The heavy duty series of punches and dies easily pierce materials up to $\frac{1}{4}$ " mild steel.

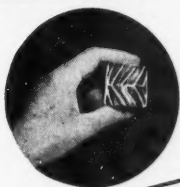
S. B. WHISTLER & SONS, INC.

740 MILITARY ROAD



BUFFALO 17, NEW YORK

PRECISION COMES IN ANY SIZE FARREL® GEAR



from 1/4 inch to 20 feet in diameter

Farrel herringbone gears are made in a complete range of sizes from 1/4 inch to 20 feet diameter, 1/4 to 60 inch face, 24 DP to 0.75 DP, for any power capacity and any application. The quiet, vibration-free performance and long life you can expect from these gears result from extreme accuracy of tooth spacing, contour and helix angle . . . qualities inherent in the Farrel-Sykes method of gear generation. Farrel engineers will be glad to assist you in working out unusual gear problems. Information about Farrel precision gears will be sent on request.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.
Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston,
Pittsburgh, Akron, Detroit, Chicago, Portland (Oregon),
Los Angeles, Salt Lake City, Tulsa, Houston,
New Orleans



Farrel-Birmingham®

FB-682

CHECK THREAD ACCURACY, ASSEMBLE-ABILITY *Visually*

WITH THE H-W *Dual*

THREAD COMPARATOR

As a companion to our Standard Thread Comparator, Hanson-Whitney now introduces the DUAL Unit. A new anvil design consists of two threaded "holes" or gaging positions that give the inspector 100% more accurate check of external threads.

1. FULL THREADED GAGING POSITION checks lead, angle and pitch diameter cumulatively for accurate test of assemble-ability.
2. 2-THREAD GAGING POSITION spot checks for suspected lead and angle errors which could easily consume a great part of pitch diameter tolerance on close fitting threading jobs. This position will also detect pitch diameter taper on long or extremely short thread lengths.

Three unit sizes available for checking NC, UNC, NF, UNF, and NS threads up to 1 1/4" diameter. All readings taken on one dial indicator to accepted ring gage tolerances, eliminating the human error-possibility of "feel."

For fast, precise gaging at machine or on inspector's bench, investigate the DUAL. Ask for detailed Data Sheet.



1. Dial Indicator, .0001 graduation with revolution counter and tolerance hands.

2. Knurled knob for securing indicator in position after setting.

3. Operating lever raises upper anvil for simple insertion of setting plug and workpieces from the front.

4. Thread Anvils hardened gage steel, lapped in place to insure factory accuracy in recording indicator readings to within .0002".

5. Base - heavy duty design for stability. Simple set screw arrangement for easy removal of unit.

HANSON-WHITNEY COMPANY

HARTFORD 2, CONN.

DIVISION OF THE WHITNEY CHAIN COMPANY

Hanson Whitney
PIONEERS OF FINISHED TAPS

9HW81

SUPERFINISH *STARTS - OR STOPS - AT SCRATCH!*

Perhaps you've thought of Superfinish only in terms of ultra-smooth surfaces. Not always! Here's one where the process has been stopped—controlled at a surface roughness of 10 micro inches. Note, in this magnification, how the abrasive grits have moved in paths which never duplicate, leaving a crosshatch pattern. For certain applications, such partially Superfinished surfaces have two distinct advantages: (1) removal of the soft "smear metal" left by grinding heat, (2) the crosshatch pattern maintains uniform distribution of lubricant to discourage spalling.

Superfinish has many other interesting applications. Write on your letterhead for the booklet, "Wear and Surface Finish."

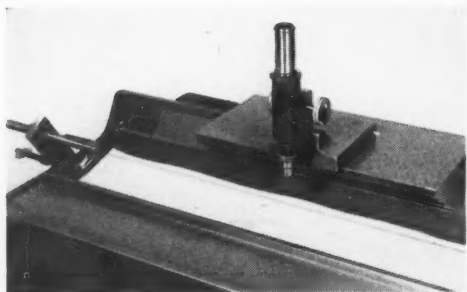
**GISHOLT
MACHINE COMPANY**
Madison 10, Wisconsin



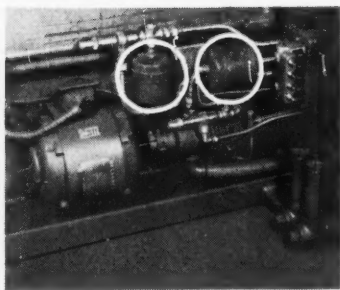
THE GISHOLT ROUNDTABLE

*represents the collective
experience of specialists
in the machining,
surface finishing and
balancing of round and
partly round parts.
Your problems are
welcome here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Microscope aligning instrument, recommended for 72" and 96" length machines. (Extra equipment)



Hydraulic and way oil filters.

Grinding the bearing diameters of a large sleeve gear. Preventative maintenance goes a long way toward expediting precision grinding operations of this type.



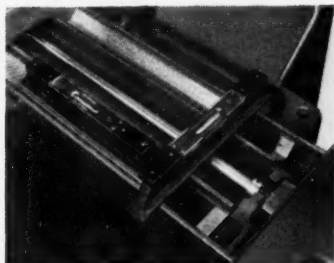
Helpful Hints for Long Service

From Your Cincinnati

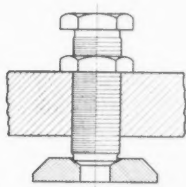


Plain Hydraulic Grinder

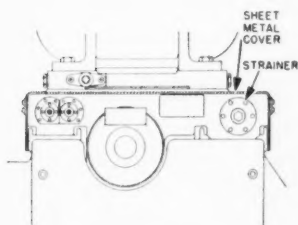
You can expect long service from your CINCINNATI Plain Hydraulic Grinders, for they give you a head start with their FILMATIC grinding wheel spindle bearings. A few points which require your periodic attention are:



Suggested method of precision leveling the machine.



Built-in leveling jacks provide a way to accurately level the machine.



Location of strainer in spindle oil reservoir.

LEVELING—Improperly leveled machines can be the source of many troubles. Jacks are built-in to facilitate the operation of leveling.

LUBRICATION—Lubrication of your CINCINNATI FILMATIC Plain Hydraulic Grinder is simple and easy; do not neglect it. As a reminder, make a lubrication chart, similar to the one in the instruction book, and attach it to your machine.

OIL FILTERS—Replace the hydraulic and way oil filters every six months. It's easy to do, and they're inexpensive. Remove and clean the spindle oil strainer every six months.

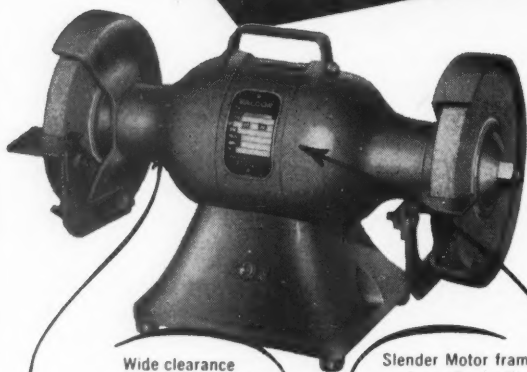
If you will take these three ounces of prevention, you will be well repaid in trouble-free, accurate performance for years. And if you're not acquainted with CINCINNATI FILMATIC 10" and 14"-L Plain Hydraulic Grinding Machines, write for literature. Ask for catalog No. G-603.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

NEW SLENDERIZED GRINDER
ESPECIALLY DESIGNED
FOR THE DIFFICULT
GRINDING JOBS



Wide clearance
around wheels permits
the grinding of odd-
shaped pieces.

Slender Motor frame
much smaller in diam-
eter than grinding wheels
permits across-the-
frame grinding.

BALDOR GRINDER

No. 600

BACKED UP BY OVER
30 YEARS GRINDER
MANUFACTURING
EXPERIENCE

$\frac{1}{4}$ H.P.
No. 619
\$41.00

**FOR FAST, ACCURATE GRINDING OF
IRREGULAR AND ODD-SHAPED PIECES**

This new BALDOR GRINDER No. 619 is powered with capacitor-start, capacitor-run motor ($\frac{1}{3}$ or $\frac{1}{4}$ h.p., 3400 r.p.m.) which will not burn out even though repeatedly overloaded. Ball-bearings lubricated for life. 6" wheels equipped with Baldor patented weights for perfect balance. Adjustable steel tool rests.

Baldor

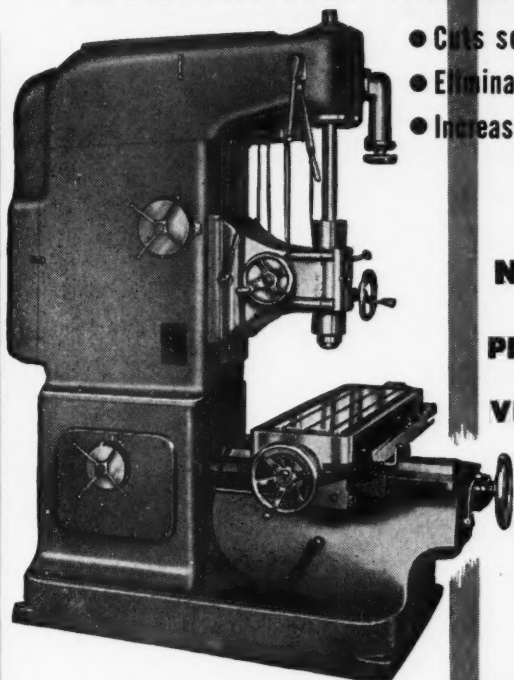
TEAR OUT THIS AD

as a reminder to write us for Bulletin
349-A containing complete details.

ELECTRIC COMPANY

4353 DUNCAN AVE. • ST. LOUIS 10, MO.

1 machine that does the work of 2!



- Cuts setup time in half
- Eliminates work transfers
- Increases output, reduces costs

KNIGHT NO. 50 FOR PRECISION BORING AND VERTICAL MILLING

Sixteen Spindle speeds, 40 to 2000 r.p.m. —
9 Spindle feeds, .005" to .010" — 100" table
traverse per minute in both directions — 16 Table
feeds, 5/16" to 20" per minute

- Handles an extreme range of difficult precision work usually done on two or more machines
- Provides exceptional cross table travel plus extra long spindle travel
- Complete selection of spindle and table speeds and feeds
- Rugged, rigid bed-type construction for positive accuracy on heaviest work
- All-gear 7½ H.P. drive—Plenty of power for large, tough jobs
- Simple, convenient controls—easy setup—clear vision—all reduce job time

ATTACH
TO COMPANY
LETTERHEAD

Mail Coupon Now
FOR COMPLETE DETAILS

W.B. KNIGHT
MACHINERY COMPANY

3920 WEST PINE BLVD.
ST. LOUIS 8, MISSOURI



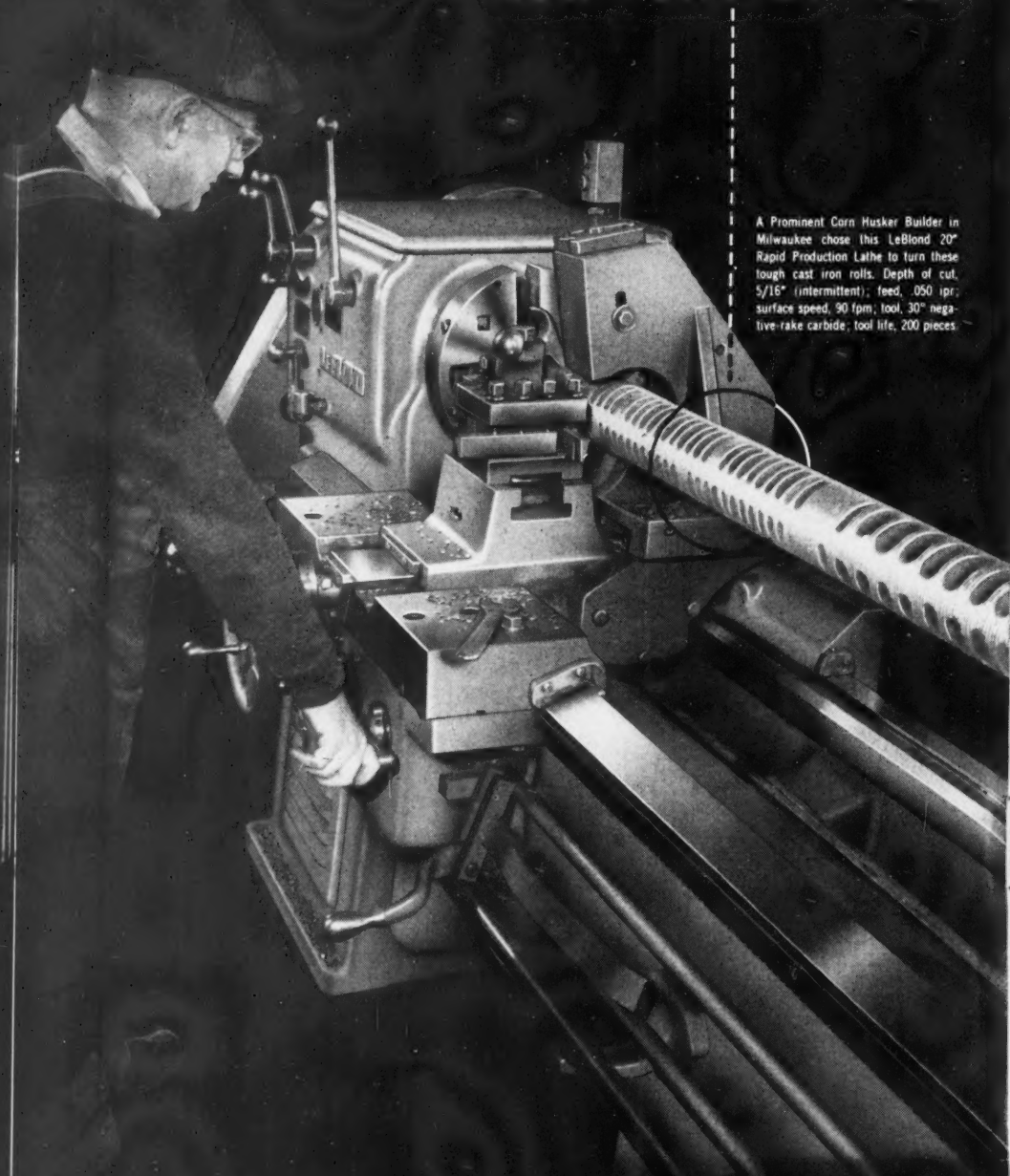
W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis 8, Mo.
We would like to have your catalog on the No. 50 and
other Knight Milling Machines.

Name

Title

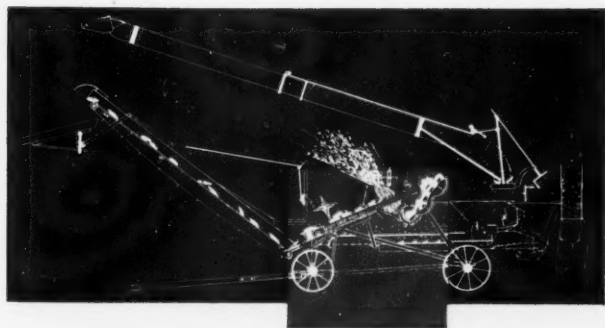
MORE GOODS for MORE PEOPLE at LOWER COST

how rolls of iron



A Prominent Corn Husker Builder in Milwaukee chose this LeBlond 20" Rapid Production Lathe to turn these tough cast iron rolls. Depth of cut, 5/16" (intermittent); feed, .050 ipr; surface speed, 90 fpm; tool, 30° negative-rake carbide; tool life, 200 pieces.

help put meat on your table



At the heart of machines that husk corn and shred the stalks into fodder are iron rolls like these! They help the farmer convert his crop to feed for livestock—the steers and hogs that become tender steaks and juicy hams for your table.

A prominent Milwaukee builder of husker-shredder machines for more than sixty years, needed a production lathe to turn these rolls . . . a lathe rugged enough to take the beating of a 5/16" intermittent cut at .050" feed and 90 surface feet per minute, and to withstand the forces of a 30° negative-rake carbide tool, cutting iron hardened by casting around a steel shaft!

On the recommendation of LeBlond's Chicago Office, they put a LeBlond 20"

Rapid Production Lathe on the job. Result? *Three and a half years of rough yet trouble-free production . . . and many more to go!*

A LeBlond 20" Rapid Production gives you high production turning of a variety of work within the range you choose. It offers two speed ranges, 45 to 300 rpm or 67 to 450 rpm, and 18 feeds from .005" to .150".

Not a converted engine lathe, it has no quick-change box or leadscrew, expensive features unnecessary for production work.

Whether you're turning rugged rolls or precision shafts, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about the 20" Rapid Production and other late models. Call him or write—

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

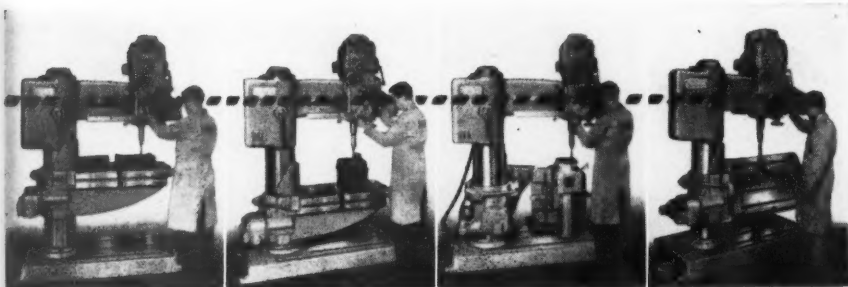
Ask for Bulletin RP-220 E
for more information on the
20" Rapid Production Lathe.

turned faster by

LEBLOND
of Cincinnati

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 63 YEARS

**no reaching....
or crouching....
for any job....**



WITH A

FOSDICK

SENSITIVE RADIAL DRILL

You can drill holes up to $1\frac{1}{2}$ " in small or large work—all from the same normal operating position on this unique machine.

The Fosdick Sensitive Radial Drill is another in a long line of Fosdick "firsts." It fills the gap between Radial and Sensitive or Upright Drill, gives you exceptional versatility, *plus* operator convenience never possible before.

The arm of this machine—always at the same height—swings 360° . The table, which moves up and down on the one-piece column, also swings 360° . It may be provided with the tilting feature illustrated. A machine base is provided for work too large for the clearance between spindle and table.

Get the whole story on this unique machine. Its moderate price and outstanding features will mean more profitable drilling in your shop. Call your Fosdick Distributor today or write for Bulletin SRMMS.

RADIAL DRILLS

SENSITIVE AND UPRIGHT DRILLS

JIG BORERS

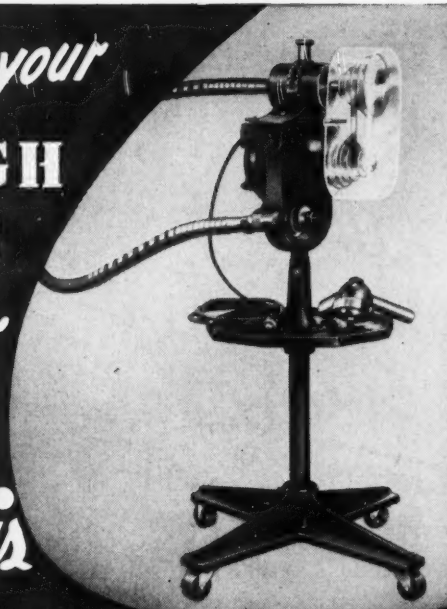
AUTOMATIC POSITIONING MACHINES

SENSITIVE RADIAL DRILLS

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

Make your
**TOUGH
 JOBS**
Easier
 with
Jarvis
FLEXIBLE SHAFT MACHINES




Dependable Jarvis Flexible Shaft Machines make your tough jobs easier — do them faster and more economically. Made to meet your individual requirements for grinding, cutting, buffing and many other operations, Jarvis Flexible Shaft Machines are available in bench, floor or overhead types — single or multiple speeds. Factory trained Jarvis representatives are ready to help you select the machines best suited to your own applications.

Long-lived Jarvis Rotary Files, depended upon the world over, are available in many shapes and flutings. For detailed information on Jarvis Flexible Shaft Machines and Rotary Files, write to The Charles L. Jarvis Company, Middletown, Conn.



TAPPING ATTACHMENTS • TECNI-TAPS and DIES • ROTARY FILES
 FLEXIBLE SHAFTS and MACHINES •

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

Ingenious New SMITH "FLO-TROL" eliminates seat burn-out

CARELESS OR INEXPERIENCED OPERATORS
CANNOT HARM SEAT IN THIS NEW SMITH TORCH!

"FLO-TROL," an exclusive Smith feature, absolutely prevents reverse flow of acetylene to cutting valve seat area, thus eliminating danger of pre-mixing and pre-ignition. You can't go wrong. It's fool-proof. Take advantage of this technical achievement to reduce maintenance costs and eliminate production delays. This new Smith Torch with built-in protection really stays on the job . . . keeps production schedules rolling.

Equipment illustrated is Smith's LIFELONG Welding Torch Body with LIFELONG Cutting Assembly: Rugged and full size for general repair, maintenance and manufacturing. Complete line of welding tips and special purpose tips is available with this model.

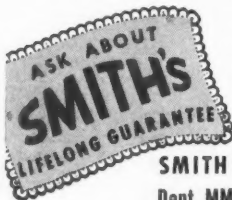
Smith's MIDLINE Welding & Cutting Equipment
Medium size and medium weight. Designed for production work and garage trade.

Smith's AIRLINE Welding & Cutting Equipment

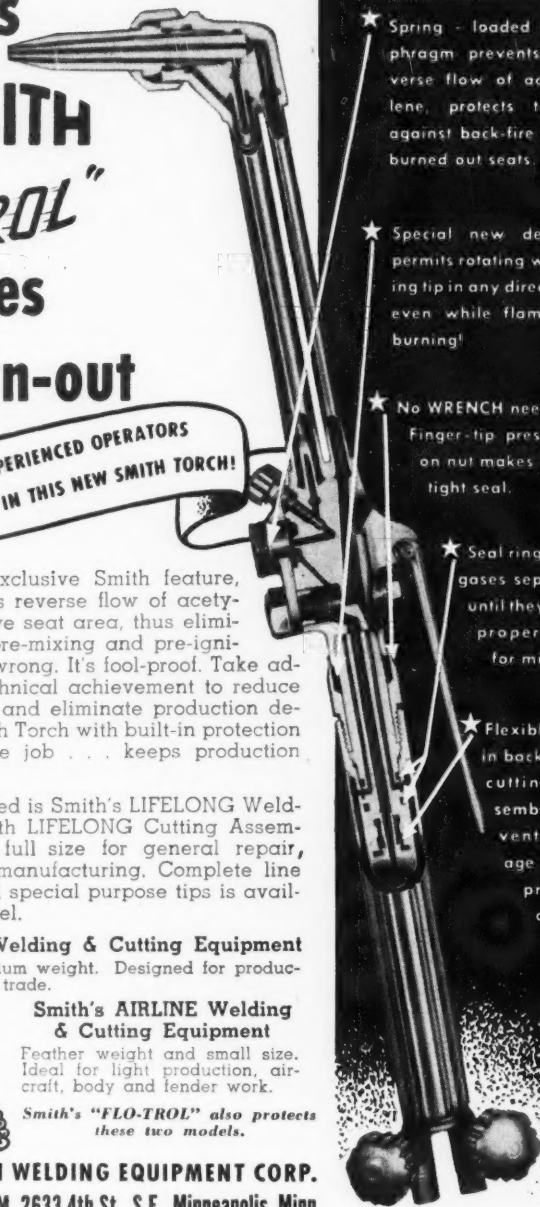
Feather weight and small size. Ideal for light production, aircraft, body and fender work.

Smith's "FLO-TROL" also protects these two models.

SMITH WELDING EQUIPMENT CORP.
Dept. MM, 2633 4th St., S.E., Minneapolis, Minn.



- ★ Spring-loaded diaphragm prevents reverse flow of acetylene, protects torch against back-fire and burned out seats.
- ★ Special new design permits rotating welding tip in any direction even while flame is burning!
- ★ No WRENCH needed. Finger-tip pressure on nut makes gas-tight seal.
- ★ Seal rings keep gases separated until they reach proper place for mixing.
- ★ Flexible insert in back-end of cutting assembly prevents leakage of high pressure oxygen.



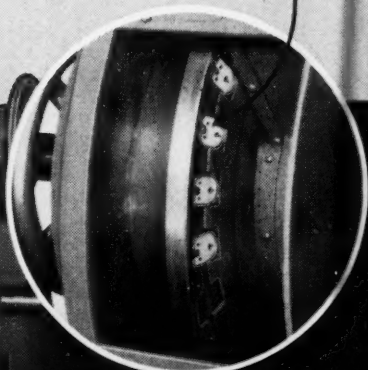
GARDNER

Precision
disc

Grinders

**40 Thin Steel
Lock Plates
Ground Per Minute**

Grinding back or edge
1 $\frac{3}{8}$ " wide, 2 $\frac{3}{16}$ " long, $\frac{3}{16}$ " thick
Tolerance .004" for uniformity



**NO. 223-23 SINGLE
SPINDLE GRINDER**
Special rotary work carrier
Hand loaded . . .
automatically unloaded

108 MS

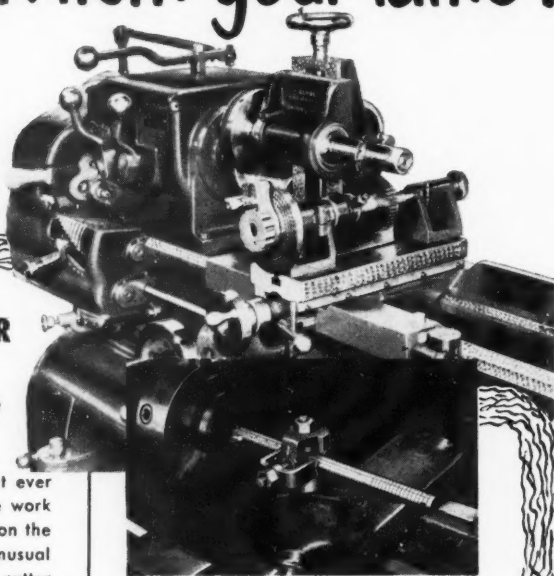
GARDNER MACHINE COMPANY
428 Gardner Street • Beloit, Wis.



Write for Catalog

YOU CAN GET more work from your lathe!

WITH THESE
GLOBE
ACCESSORIES



GLOBE MILLER

*converts lathe
to milling machine
in 3 minutes!*

Best milling attachment ever developed! Keeps the work low, solidly mounted on the table! Possesses unusual vertical travel—spots the cutter or drill wherever needed! Performs all miller functions: faces, form cuts, slits, bores, drills, locates; cuts tee slots, keyways, dovetails, gears etc.

Mounts a chuck for an additional 5" to 10" of lathe swing! Complete line of accessories available. Here's a tool that can save you the cost of a mill or relieve an overworked mill! Write for literature on the GLOBE Miller.

GLOBE BORING BARS and HOLDERS

In the GLOBE Boring Bar Holder two independent clamps are used—one mounts the holder to the lathe compound, the other grips the bar. Once mounted bars can be interchanged at will without altering alignment of bar with lathe bore! Vertical Vee block automatically locates cutter bits at correct height—regardless of bit size used—without shimming or other adjustment. Graduated bars instantly indicate depth of bore, saving measuring time. Rigid design eliminates chatter—insures heavy cuts and smooth finishes. Many sizes for all lathes. Write for circular.

★ **GLOBE** ★
HEAT-SEAL, INC.
MACHINE TOOL DIVISION

3384 Robertson Boulevard
Los Angeles 34, California

Pantography at Work



Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.

GORTON

- IMPROVES QUALITY
- INCREASES PRODUCTION • CUTS COSTS

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

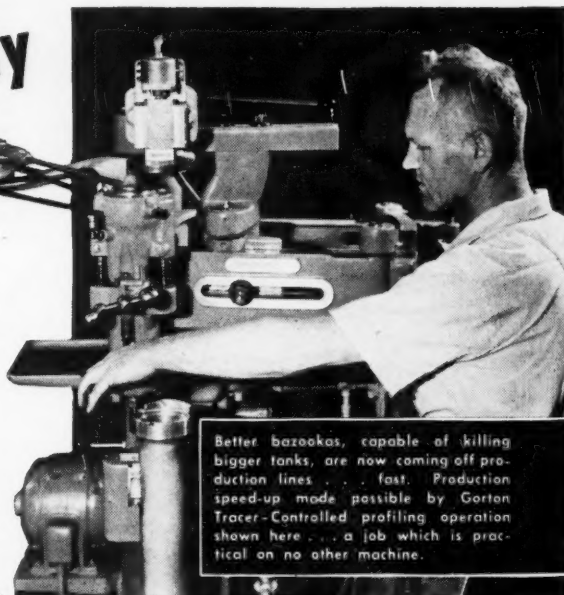
Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

**GEORGE
GORTON
MACHINE CO.**



1711 Racine St., Racine, Wis., U.S.A.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka

MATERIAL: Aluminum alloy

CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually

HOLDING FIXTURE: Pneumatic-operated internal expanding type

APPROX. TIME: 36 pieces per hour

ALTERNATE METHODS: None practical

Please send at once complete information about the Gorton line contained in Bulletin 1655-1711.

Firm

Name

Title

Address

City, State

FORESIGHTED

against



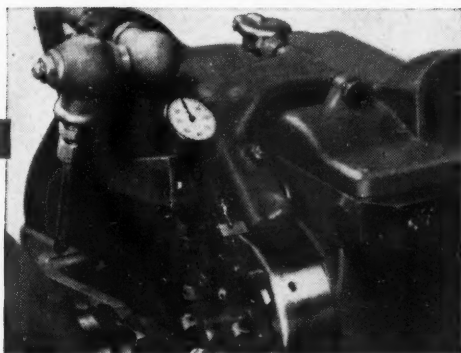
Constant-speed drive shaft insures uniformly rapid automatic movements. Change gears provide production rates from 3 to 364 seconds for one piece per cycle. 16 spindle speeds from 10,000 to 910 r.p.m. Takes stock to $\frac{1}{4}$ " dia. and turns up to $2\frac{7}{8}$ " length.



Brown & Sharpe

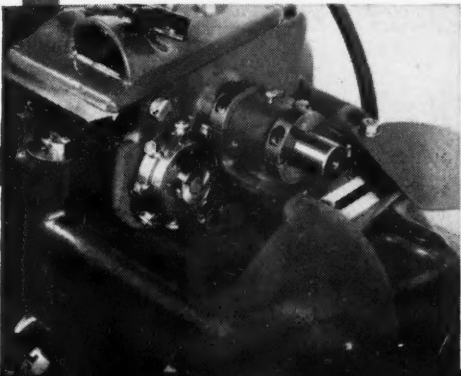
PROTECTION

Skilled-Operator Shortage...



Tool Adjusting Dial Indicator on swing-arm affords quick, accurate replacement of tool . . . saves time and cut-and-try spoilage.

Individual Micrometer Stops for each tool simplify accurate duplication of parts without machining cams to extremely close accuracy.



Brown & Sharpe Automatic Pinion Turning Machine

equips you for high output,
without expert
pinion turning specialists!

With defense orders now adding to normal demands for staff and pinion work, the Brown & Sharpe Automatic Pinion Turning Machine represents one of the soundest investments many manufacturers can make.

This modern automatic single-point turning machine dependably meets all close-tolerances and fine-finish requirements of military and civilian assemblies such as clocks, instruments, fuses and timers. What's more, accurate operation with exceptionally high uniformity can be maintained without highly skilled operators.

Write for detailed specifications.
Brown & Sharpe Mfg. Co.,
Providence 1, R. I., U. S. A.



RECORD CARD
PART: automotive intake manifold
OPERATIONS:
 spot face 12 27/64" holes
 drill & countersink 2 3/8-16 tap holes
PRODUCTION RATE:
one per minute

...on this
MORRIS
Mor-Speed
PRODUCTION MACHINE



Imagine the precision drilling machines that would be necessary to machine this piece on a non-automatic basis. Think of the space, operators, transfers from machine to machine and the time wasted. Contrast that with this specially designed Morris MOR-SPEED High Production Machine.

A single hand clamp fixture holds the work while the machine automatically indexes through four stations. The rear angular head, mounted on hardened and ground ways, carries six spindles for the spot facing operation. The two angular heads on either side alternately drill and countersink the two tap holes. Rated production of 60 pieces per hour is accomplished at 75% efficiency.

THE MORRIS
MACHINE TOOL COMPANY

HARRIET STREET CINCINNATI 3, OHIO

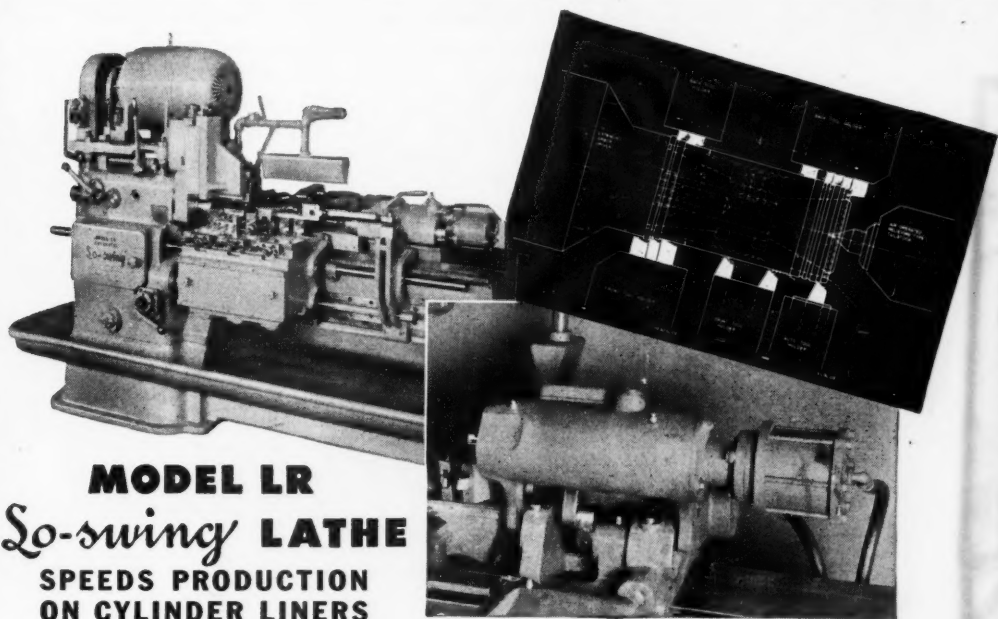
"A better product
 at less cost—
 with



PRODUCTION plus PRECISION"

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



MODEL LR Lo-swing LATHE SPEEDS PRODUCTION ON CYLINDER LINERS

Problem: To automatically turn outside diameters, face and groove cast iron Cylinder Liners of various types with Carbide Tools.

Solution: Model LR Lo-swing Automatic Lathe was selected for this job because of its demonstrated fine performance with carbide tools, and its ease of setting-up due to its Simplified Change-Over Mechanism. A Relieving Tailstock which minimizes tailstock spindle overhang, and which facilitates loading and unloading, was incorporated.

The cast iron cylinder liners are delivered to the Lathe with the bore machined to size and the large end faced. They are held and driven with an air-operated, expanding collet arbor which extends the full length of the piece. This large area

driving surface permits the high cutting speeds and coarse carriage feeds required for fast production. Loading of the parts is simplified with the Relieving Type Tailstock, shown in the close-up illustration. Since the driving arbor is bolted to the spindle nose, the operator is relieved of handling heavy stub arbors generally used when work is held between centers. The outside diameters and the short taper on the tailstock end of the liners are turned with six tools mounted on the front slides; all facing and grooving operations are accomplished with tools mounted on the rear slide. The entire operation is automatic—the operator simply loads and unloads the parts and pushes the starting button.

Seneca Falls engineers are at your disposal to assist you with your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

The HIGHLIGHT of the METAL SHOW!

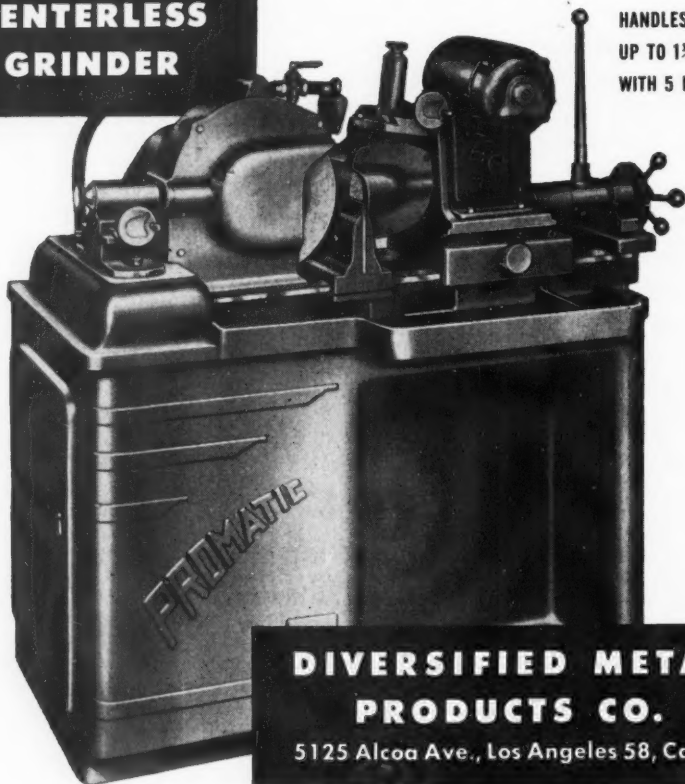
Publicly exhibited for the first time at the 1951 Metals Congress, the new PROMATIC Centerless Grinder proved an instant hit!

At last you can do your own centerless grinding with a reasonable investment and pay for it with savings from "Outside Costs." The PROMATIC produces micro-finishes on all work up to 1½" O. D. and, because of its simplicity, banishes operating and maintenance problems!

Write for descriptive literature and quotations.

PROMATIC
CENTERLESS
GRINDER

HANDLES WORK
UP TO 1½" O. D.
WITH 5 H. P. MOTOR



**DIVERSIFIED METAL
PRODUCTS CO.**

5125 Alcoa Ave., Los Angeles 58, Calif.

Waldes Truarc Internal Grooving Tool

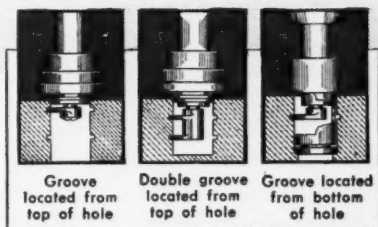
for precision cutting of internal grooves
in bores and housings

FAST! ECONOMICAL! NEEDS NO SKILLED LABOR!



Internal groove-cutting becomes the simplest of operations with Waldes Truarc Internal Grooving Tool. Easy to adjust—easy to operate...readily adaptable to individual requirements.

Designed for use in any hand drill or automatic drill press and screw machine... assures a concentric recess without injury to metal. Operates by fingertip pressure—especially suitable for unskilled operators.



The Waldes Truarc Grooving Tool when used in an electric or pneumatic hand drill, can be taken to the job eliminating disassembly and excessive handling...resulting in all-around savings in time and costs!

Write now for descriptive brochure giving mechanical details,
cutting sizes...extra features



WALDES
TRUARC
GROOVING TOOL

WALDES KOHINOOR, INC., 47-16 Austel Place, Long Island City 1, N.Y.

Waldes Truarc Grooving Tool

Manufactured under U. S. Pat. 2,411,426

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, New York MM 113

Please send me your descriptive brochure on
Waldes Truarc Internal Grooving Tool.

Name

Title

Company

Business Address

City Zone State

"MARVEL" HAS

always had the edge



MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, come the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—they will not shatter.

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary high speed steel blades.

1. High Speed Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is positively unbreakable.

ARMSTRONG-BLUM MFG. COMPANY

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE

CHICAGO 39, ILLINOIS



"Most profitable turning investment we have ever made"

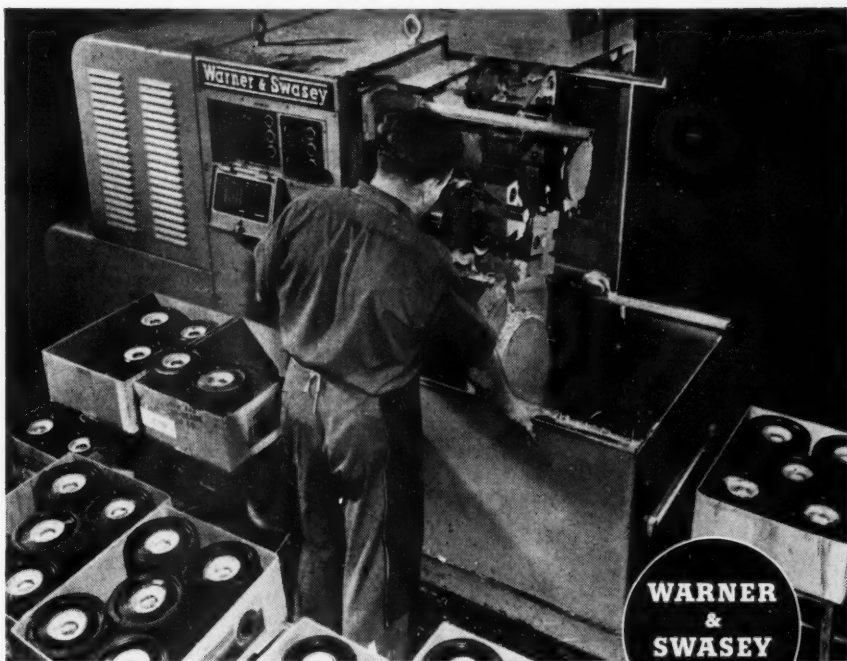
● This is the enthusiastic approval given the Warner & Swasey 1-AC Single Spindle Automatic by H. C. Stebbins, President of Cloyes Gear Works Inc. Timing gear specialists to the automotive industry for 30 years, his 50-man shop was faced with the necessity of expanding operations—without costly building construction—in the face of today's tight manpower situation.

The Warner & Swasey 1-AC answered this complex problem. Using the same floor space, production has been doubled on jobs previously done on hand operated machines. And scarce machine operators have been released for other important jobs in the plant.

Charles Laslo, Plant Superintendent, reports

that he finds the 1-AC adaptable to more and more jobs. And setup is quick—requiring no more time than was necessary for hand operated machines. In fact, it has been found profitable to set up for as few as 100 pieces—most unusual for an automatic machine. The 1-AC's over-all greater accuracy has improved the finished product, and limits of one-thousandth of an inch on bores have been maintained.

So before you make any additional investments in machine tools—or in additional building construction—first call in your nearest Warner & Swasey Field Engineer. He'll show you how Warner & Swasey Automatics can increase production in your existing floor space, and conserve your manpower.



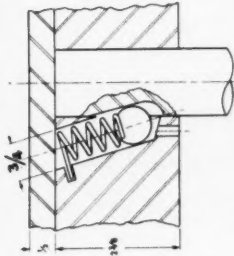
Warner & Swasey 1-AC Single Spindle Automatic in use at Cloyes Gear Works Inc., Cleveland, Ohio

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES



SOLVED

**- Heavy Piercing Problems
with New R-B Extra Heavy Duty Retainer**



Here's a new combination of an extra heavy duty retainer and new punch design that brings economies of R-B interchangeability to hole-making formerly done by drills or without interchangeable punches.

For instance, in the application shown above, this heavy duty design enabled interchangeable punches to pierce $\frac{5}{8}$ " thick SAE 10-45 steel and eliminated costly drilling. The ball lock gives positive alignment and sure stripping without the use of other keying devices.

If you have thought your piercing jobs too tough for interchangeable punches, then it will pay you . . . in design, construction and operation savings . . . to investigate this new R-B extra heavy duty retainer. **Allied Products Corporation, Richard Brothers Division.**

CHECK THESE OTHER R-B FEATURES, TOO!

- ✓ Reduce press down-time for replacements
- ✓ Simple in construction
- ✓ Save design and assembly time
- ✓ Prompt service on special requirements

ALLIED PRODUCTS CORPORATION RICHARD BROTHERS DIVISION

DEPT. 59 • 12625 BURT ROAD • DETROIT 23, MICHIGAN

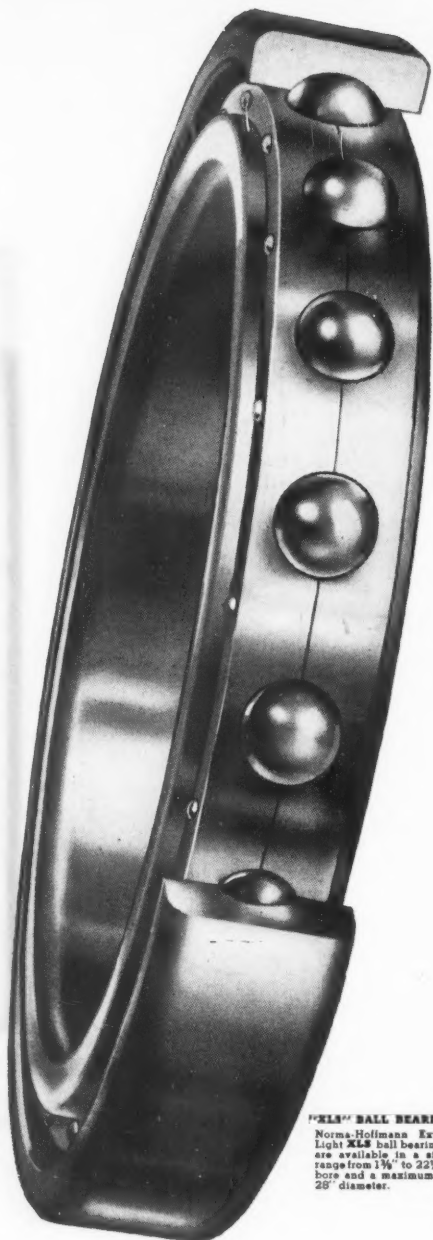
Please send me your 52-page free catalog.

NAME _____ TITLE _____
 COMPANY _____
 ADDRESS _____
 CITY _____ ZONE _____ STATE _____



Also Produced in

ALLIED'S FOUR PLANTS
 HARDENED AND PRECISION
 GROUND PARTS • STANDARD
 CAP SCREWS • SPECIAL COLD
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 DIES • ALLITE DIES CAST OF
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"XLS" BALL BEARING
Norma-Hoffmann Extra Light XLS ball bearings are available in a size range from 1 1/4" to 22 1/2" bore and a maximum of 28" diameter.

Crowded
for Room?

NORMA-HOFFMANN

EXTRA LIGHT XLS SERIES

Precision Bearings Provide greater latitude in designs

These Norma-Hoffmann *Extra Light* Precision Ball Bearings—**XLS** types—provide the solution to cramped bearing space in machine design. In addition to the advantages of low friction, compactness and light weight, the abnormally large bores, compared to outside diameter, give designers greater latitude in designs of their equipment. They are also suitable for combined radial and thrust loads in either direction. Investigate Norma-Hoffmann *Extra-Light* Precision Bearings for your designs. Our Field Engineers will gladly aid you in the application and selection of the proper bearing for your particular designs. Write for their services and catalog.

NORMA-HOFFMANN *Precision* **BEARINGS**

NORMA-HOFFMANN BEARINGS CORPORATION,
STAMFORD, CONNECTICUT

FIELD OFFICES: Chicago, Cleveland,
Detroit, Cincinnati, Los Angeles, San
Francisco, Dallas, Seattle, Phoenix.

SAVE UP TO 50% in over-all boring time

Davis Block-Type Cutters Eliminate Trial Cuts and Extra Adjustments

There's no time wasted taking trial cuts and resetting cutters several times to get a bore size. Operators can quickly duplicate at the machine accurate settings established in the tool room.

What's more, using Davis block-type cutters — you can bore different sizes, face, chamfer and counter-bore one or more holes on the same axis in a single operation! If you want to change tools — simply slip out one block — slip in another — quick and easy like changing a razor blade.

Especially on turret lathes—Davis Multiple-Cutters save time! One Davis multiple cutter completes boring, counter-boring, reaming, chamfering and similar cuts in a simple indexing of the turret.



Typical example of Davis "Complete Tooling Service" — showing finished part with its fixture, standard Davis designed block-type tools and boring bars for rough and finished boring, counter boring and facing.

♦ Tapered centering hole and taper lock screw brings the cutter to positive position immediately upon assembly in bar.

Davis "Complete Tooling Service"

Increases production... lowers cost... gives you greater flexibility of equipment

Davis "Complete Tooling Service"—backed by a world-wide sales and service organization — offers you a full line of standard boring tools (capacity — any diameter from $\frac{1}{4}$ " to 54")... plus design and construction of special tools to meet your particular requirements.

Davis maintains a large staff of design engineers and field servicemen to aid you in every phase of efficient tool selection.

Now you can standardize your whole shop on one complete line of modern tools... count on one dependable source of supply and engineering help... share in the very latest developments in tool design. You can realize all the advantages of the Davis "Complete Tooling Service"... increased production, lower costs and greater flexibility of your equipment.

Check This Full Line...

Send For Catalogs

1. Block-type boring tools.
2. Micrometer-type boring tools.
3. Micrometer adjustable block-type boring tools.
4. Fly-cutter-type boring tools, SUPER micrometer.
5. Stub boring sets, SUPER micrometer.
6. Boring heads (standard or special).
7. Planer tools.
8. Vertical boring and turning mill tools.
9. Quick-change arbors, sleeves and spindles.
10. Line boring bars (standard or special).

DESIGNED FOR EVERY
BORING AND REAMING
REQUIREMENT



Regular Type



Single Cutter
Micrometer Type



Multiple
Cutter Type



Solid Type
Block Cutter



DAVIS BORING TOOL

Division of GIDDINGS & LEWIS MACHINE TOOL COMPANY

Fond du Lac, Wisconsin

World's Largest Builder of Horizontal Boring, Drilling and Milling Machines • Planer-Type Milling Machines • Large Vertical Boring Mills

MARK IT FOR MARKET!



CLEAN...LEGIBLE...PERMANENT...

MODEL
175
HYDRAULIC



Identification **ROLLED** into your products will help you market them.

Hack Saw blade above has been permanently marked in a Model 175 Hydraulic Marking Machine using a solid engraved lettering knurl.

Your name, model number, part number, serial number or decorative designs can be rolled into your components to improve their appearance and facilitate identification.

Send prints of parts, showing required marking and its location on part with hourly production for free recommendation.

WRITE FOR CATALOG



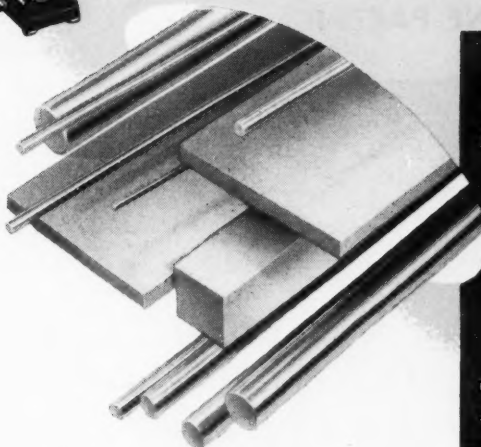
GEO. T. SCHMIDT, INC.

**1806 W. BELLE PLAINE AVE.
CHICAGO • 13 • ILLINOIS**

NEED DRILL ROD OR GROUND FLAT STOCK **Quick?**



CALL DoALL TODAY



NOW AVAILABLE
DoALL COMMERCIAL AND
OIL HARDENING DRILL ROD
COMPLETE SIZE RANGE
IMMEDIATE DELIVERY!

**PRECISION GROUND
OIL HARDENING
FLAT STOCK**

*Greatest Selection Available
Anywhere — Over 200 Sizes*

CALLING DoALL for fast delivery on any size **PRECISION GROUND FLAT STOCK** and **Drill Rod** is the best way to save time and money in making tools, dies and parts. Get the size you want, large or small, no need to buy a large piece for a small job. Controlled analysis DoALL tool steel assures accuracy and top quality. Write today for Charts and Bulletins showing standard sizes.

THE DoALL COMPANY

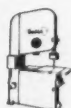
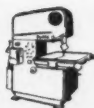
254 N. Laurel Ave., Des Plaines, Illinois

TS-6



DoALL HINT:

For quick, economical cutting of DoALL Ground Flat Stock just ink it, make your layout and cut direct to your lines using a DoALL Contour Band Machine with a DoALL Saw Band.

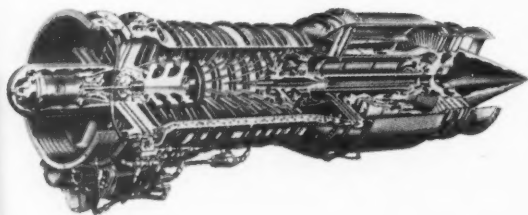


CONTOUR SAWING MACHINES • SURFACE GRINDERS • GAGES • CUTTING TOOLS & INDUSTRIAL SUPPLIES

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BY TOOL ENGINEERS
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HAS CONVERTED MANY CONVENTIONAL
GRINDERS—BUFFERS—POLISHERS
INTO SPECIAL OR SINGLE PURPOSE MACHINES
TO PRODUCE **JET ENGINE PARTS!**



FURNISH US
WITH DETAILS
OF YOUR
REQUIREMENTS

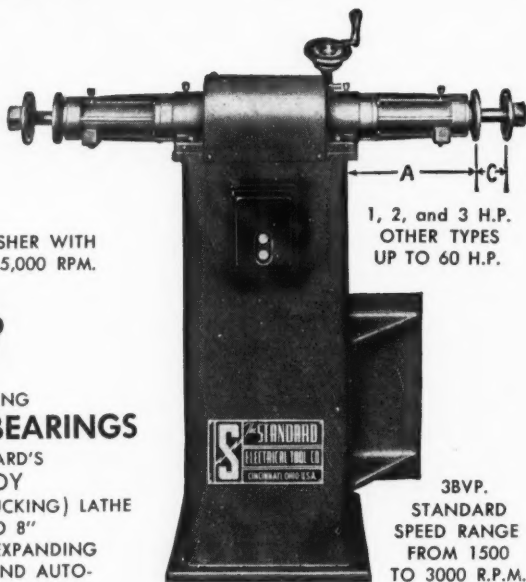
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AIRFOIL FORMS
USE STANDARD'S
TYPE 3VJ →

INFINITELY VARIABLE SPEED POLISHER WITH
SPEED RANGE FROM 10,000 TO 15,000 RPM.
MERELY TURN THE →



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MAIN BEARINGS

USE STANDARD'S
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SPEED (CHUCKING) LATHE
WITH UP TO 8"
DIAMETER, EXPANDING
MANDREL AND AUTO-
MATIC AIR CONTROL.



1, 2, and 3 H.P.
OTHER TYPES
UP TO 60 H.P.

3BVP.
STANDARD
SPEED RANGE
FROM 1500
TO 3000 R.P.M.

Write for Catalog 44 today.

the **STANDARD** electrical tool co.

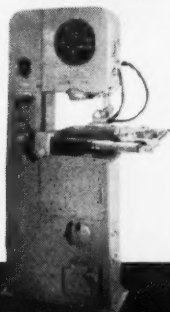
2487 RIVER RD. • CINCINNATI 4 • OHIO

Also: GRINDERS—ALL KINDS! UP TO 100 H.P. BUFFERS—POLISHERS UP TO 60 H.P.
ABRASIVE BELT MACHINERY. SPECIAL MACHINERY. TWIN WHEEL TOOL GRINDERS.

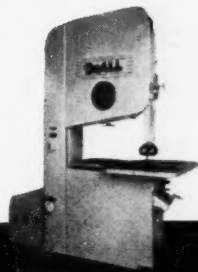
THERE IS A DoALL BAND MACHINE FOR EVERY PURPOSE AND EVERY POCKETBOOK



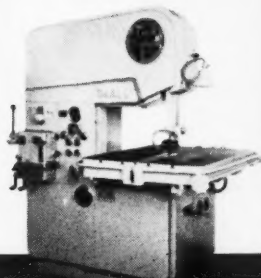
**"UTILITY" BAND SAWING AND
FILING MACHINES**—Four models
—16" throat. Two speed range 50
to 350 F.P.M. and 860 to 5200
F.P.M. Also available fixed speed.
For small shops and experimental
or model work in large shops.



"ML" CONTOUR MACHINES—Five
models—Precision machines for
general purpose band sawing, fil-
ing, polishing. 50 to 1500 F.P.M.
variable speed for conventional
metal cutting. Throats 16" to 60".



**HIGH SPEED "ZEPHYR" MA-
CHINES**—High speed 500 to 15000
F.P.M., fixed or variable. 16" to
60" throats. For high speed saw-
ing of non-ferrous metals and
non-metallics, friction cutting fer-
rous sheet, plate up to 1".



THE "CONTOUR-MATIC"—The fea-
tures and capabilities of all other
models plus hydraulic controls,
wider speed range, more power,
greater tool variety, etc. Cuts any
material, any shape. Use as all-
purpose or single purpose tool—
works faster, better; cuts costs,
increases output per man.

EVERY SHOP can have the benefits of DoALL
band machining, the fast, economical process that
"slices" material apart instead of reducing it to pile
of chips. There is a DoALL Band Machine and Band
Tool for precision cutting every material, every shape
—sawing, line grinding, polishing, honing, friction
sawing, cutting. For production, for maintenance,
for toolmaking—a DoALL will save manhours,
material and money, free other machines for work to
which they are better suited. Ask to have a free
DEMONSTRATION right in your plant.
Call your local DoALL Sales-Service Store
or write:

The DoALL Company, 254 N. Laurel Ave., Des Plaines, Ill.

SEND FOR CATALOG ▶ ▶ ▶ ▶

Learn about the complete machining facilities offered
by modern DoALL Band Machines.

DoALL

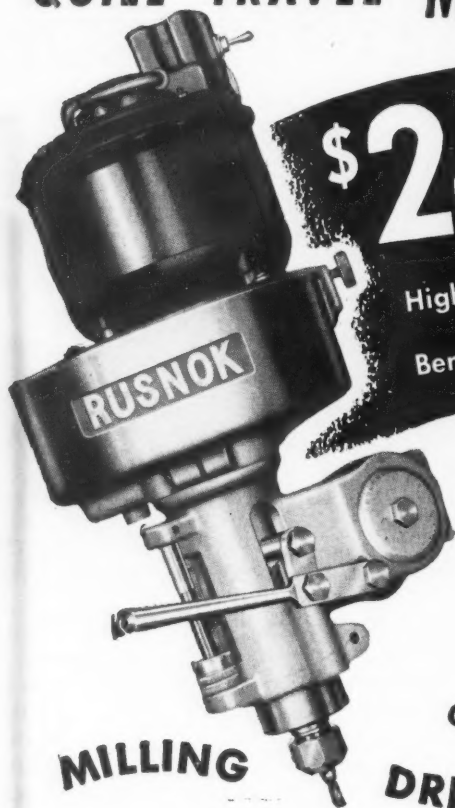


B-35



Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

VERTICAL QUILL TRAVEL MILL ATTACHMENT



\$245⁰⁰

COMPLETE
WITH MOTOR
FOB Chicago

High speed, medium and light
operation made for
Bench, Floor and Pedestal Mills.

New!

PRECISION MADE BY

RUSNOK

ONLY LOW COST

QUILL TRAVEL ATTACHMENT

MILLING

DRILLING BORING

- Quill travel 1½"
- Five spindle speeds
380, 700, 1200, 2500, 5200 RPM
- Micrometer depth stop
- Positive Quill lock
- Forward, stop, reverse control
- Angular settings, single
and compound
- Full use of table travel
- Time-saving settings
- Quick, easy speed change
- Light, efficient rigid

WRITE TO

TOOL

4840 W. North Ave.

RUSNOK

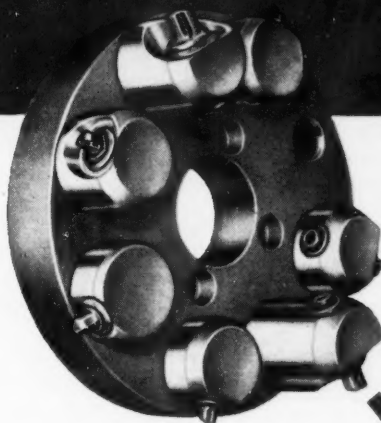
FOR BULLETIN C

WORKS

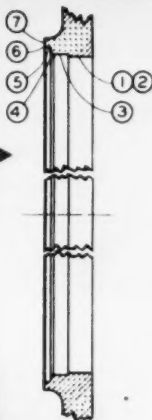
Chicago 39, Illinois

MICROBORE

Special BORING BARS



Special bar used in boring, counterboring and chamfering (in one operation), a cover for a jet engine combustion chamber.



OPERATIONS

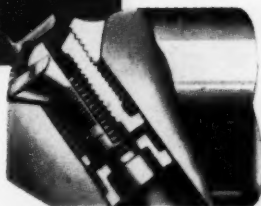
1. Rough Bore 10.855 Dia.
2. Finish Bore 10.8755 Dia.
3. Bore 11.000 Dia.
4. Form 30° Chamfer
5. Bore 11.252 Dia.
6. Form 45° Chamfer
7. Face Boss

There is a Microbore representative in your area who will be pleased to call on you for further consultation.

BORING ●
TURNING ●
FACING ■

ILLUSTRATED
CATALOG
MAILED
ON REQUEST

Each tool independently adjusted by proven micrometer, vernier principle.



DeVLIEG MICROBORE COMPANY

Avey BMA-6 TOOL ROOM DRILL

Built in No. 2 and No. 3 Sizes

LARGE TABLE MACHINE having either Hand Feed, Power Feed, *Avey-Matic* or Reversing Motor and Control for Tapping.

This machine has proved to be very popular with Tool and Die Shop men, also production men. The large heavily ribbed table that is 34" x 25", plus ample chip trough, allows plenty of room for large dies or fixtures, plus additional space for tooling, etc. Each six-spline precision ground spindle and drive sleeve is supported by five rows of precision ball bearings which give the precision needed today and in years to come.

The machine can be obtained with either of three speed ranges: low, medium, or high. Speed ranges are easily changeable for future jobs requiring higher or lower speeds, which is a necessity today with ever-changing design. Where power feed is desired four rates of feed are furnished.

Also manufacturers of

**DEEP HOLE DRILLING MACHINES
DRILLING AND TAPPING UNITS
AUTOMATIC INDEX TABLES
SPECIAL DRILLING AND TAPPING
MACHINES**

THE AVEY DRILLING MACHINE CO.

CINCINNATI 1, OHIO



UPS PRODUCTION 25% BETWEEN DIE GRINDS

DoALL "COOL-GRINDING" (U.S. PATENT NO. 2470390) GIVES IMPROVED FINISH ON HIGH CARBON HIGH CHROME NN STEEL

"COOL-GRINDING" WILL PREVENT BURNED OR
SCORED FINISH, LENGTHENS THE LIFE OF YOUR TOOLS



"Cool-Grinding" takes liquid in at the hub of the wheel, and through centrifugal force passes it through the pores of the wheel and out as a fine mist at the point of contact between the wheel and the work.

SEND FOR CATALOG Today

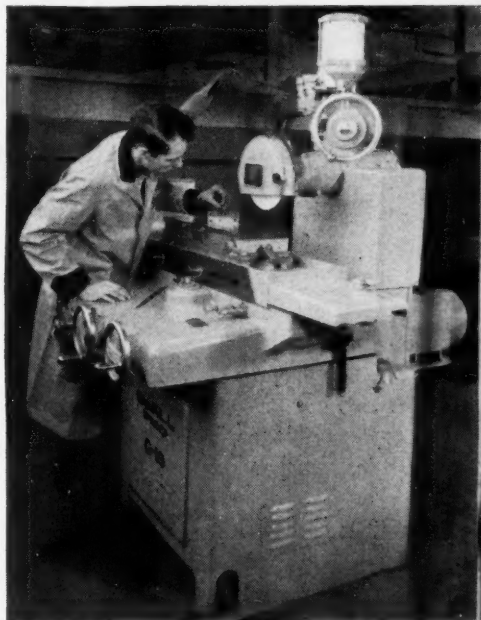
— see how "Cool-Grinding" works,
why it is better, how it will benefit you
— see the different models of DoALL
Precision Grinders for toolroom or
production work.



THE DoALL COMPANY • 254 N. LAUREL AVE. • DES PLAINES, ILL.

INDUSTRY'S NEW TOOLS

27 SALES-SERVICE STORES

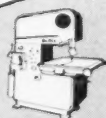


ONWARD Manufacturing Company, Ltd., Kitchener, Ont., knows the benefits of DoALL "Cool-Grinding." They say, "Since using this Grinder with 'Cool-Grinding' we have obtained a 25% increase in number of pieces per die grind over former methods of grinding."

WHY? Because DoALL "Cool-Grinding," with coolant flowing through the wheel, prevents excessive heat that scores, draws the temper or checks the metal finish. The finish is smoother, too. The die does more work before it needs grinding. You save time and money and material. Ask to have a Free DEMONSTRATION of DoALL "Cool-Grinding" at your own plant. Call your local DoALL Sales-Service Store or write:

DoALL

CALL DoALL FOR:



Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

Check

**THESE
PRODUCTION EXTRAS:**

- ✓ ALL-GEARED HEAD
- ✓ QUAD-V-BELT MOTOR DRIVE
- ✓ SEPARATE LEAD SCREW, FEED SHAFT
- ✓ SPEED FOR CARBIDE MACHINING



Buy **THE MOST LATHE**
FOR MORE WORK

● These are but a few of the production extras offered on Rockford Economy Lathes — and in a price class usually found only for smaller, lighter tools.

Rockford Lathes have ample reserve to take care of a wide range of straight-production, tool room or maintenance work. Features include 5 H.P. motor, 1-9/16" spindle hole, and quick change gear box providing carriage feeds from .004" to .060" and full range of threads from 4 to 56.

Twelve spindle speeds are easily and quickly selected through convenient shift levers. The spindle and all head shafts run in precision Timken bearings. These features assure capacity for close work, fast set-up, savings in non-productive time, and easier work for the operator.

When you're buying lathes, look for the *most* lathe, to give you *more* work. A Rockford representative can give you this complete story, price and all. Why not call him today and be set for those lathe jobs.

Ask for a copy of our Bulletin 900C.

**MEDIUM SIZED
ECONOMY PRICED**

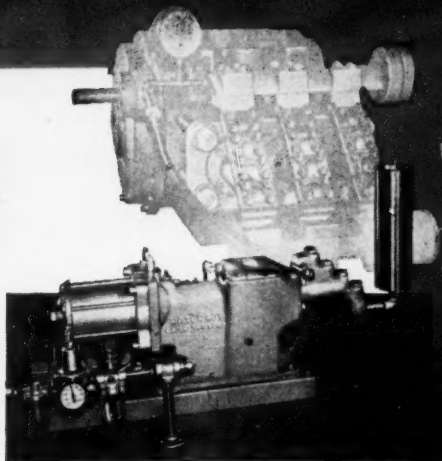
ROCKFORD ECONOMY LATHES—16" and 18"

ROCKFORD MACHINE TOOL CO. • ROCKFORD, ILLINOIS

why **EVERY**

air-powered pump

includes a...



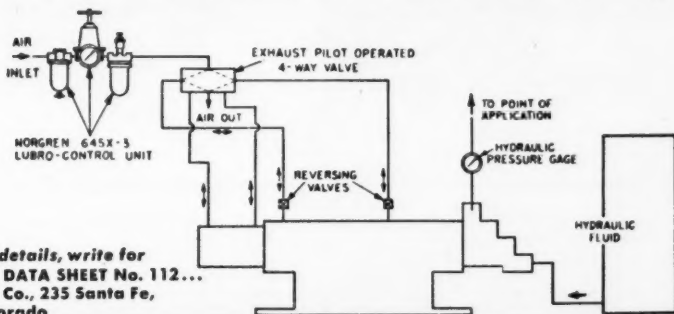
NORGREN LUBRO-CONTROL UNIT...

1. **Closely Controlled** balance between air and hydraulic pressures is vital.
2. Positive, automatic lubrication of valves and cylinders is essential.
3. Roy engineers proved Norgren units mean "reliable, trouble-free, long-lived service."

This Customer States: "Norgren Lubro-Control Units meet ALL of our requirements. We have standardized on Norgren units for all our air-powered pumps."

Progressive industries are finding almost limitless new, profitable uses for air power. This demands

clean air, controlled air, and automatic oil-fog lubrication. So be sure to check with Norgren!



For complete details, write for APPLICATION DATA SHEET No. 112...
C. A. Norgren Co., 235 Santa Fe,
Denver 9, Colorado

Norgren



Lubricators, Regulators, Filters,
Relief Valves, Check Valves,
Air Governors, Needle Valves,
Hose Assemblies and Couplings.

25 YEARS OF HELPING AIR POWER SERVE INDUSTRY BETTER

VISIT OUR BOOTH
PLANT MAINTENANCE
SHOW
PHILA. JAN. 14-17

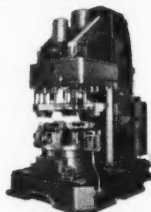
NATCO OFFERS

50 Years Experience

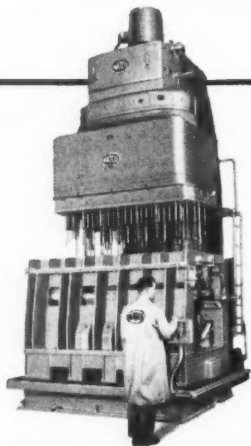
IN BUILDING A COMPLETE
RANGE OF DRILLERS, BORERS,
FACERS AND TAPPERS



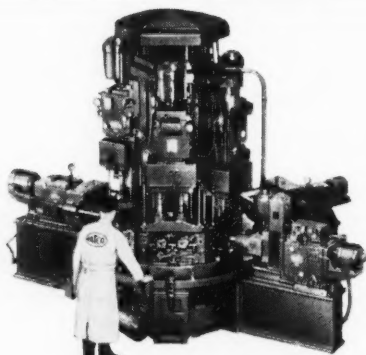
NATCO LIGHT SENSITIVE
DRILLER AND TAPPER



NATCO HOLESTEEL ADJUSTABLE
DRILLER AND TAPPER



NATCO HEAVY DUTY HOLESTEEL DRILLER

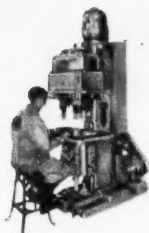


NATCO STATION TYPE MACHINE

Out of the past fifty years of NATCO experience has come a deeper understanding of today's engineering and production problems. By reason of this maturity of understanding the NATCO organization is better equipped to help you solve your drilling, boring, tapping and facing problems. Better equipped with experienced engineers and designers. Better equipped with the most complete range of adjustable and fixed center multi-spindle machines in the world.

A few of the various NATCO machines are illustrated above. As you can see they range from small, fast, light-sensitive multi-drillers and tappers to large automatic processing machines from single spindle to an unlimited number of spindles, from one direction to any number of directions, vertical, horizontal or angular, special or standard and operations range from 1/16" drill to 14" or larger bore. The materials worked include iron, steel, bronze, aluminum, wood and plastic.

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana



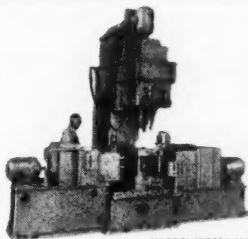
NATCO HIGH SPEED SENSITIVE
DRILLER AND TAPPER



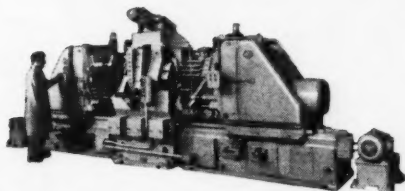
NATCO HIGH SPEED SENSITIVE UNIT



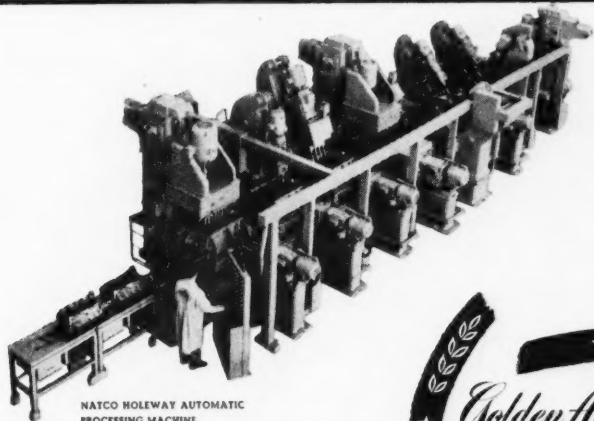
NATCO ONE-WAY TURNING
BORING AND FACING MACHINE



NATCO THREE-WAY TAPPER
WITH INDIVIDUAL LEAD SCREW



NATCO THREE-WAY TRUNNION
TYPE DRILLING MACHINE



NATCO HOLEWAY AUTOMATIC
PROCESSING MACHINE

Today NATCO offers you not only fifty years experience and ample production facilities but also several branch offices conveniently located to serve you in Detroit, Chicago, Buffalo and New York City

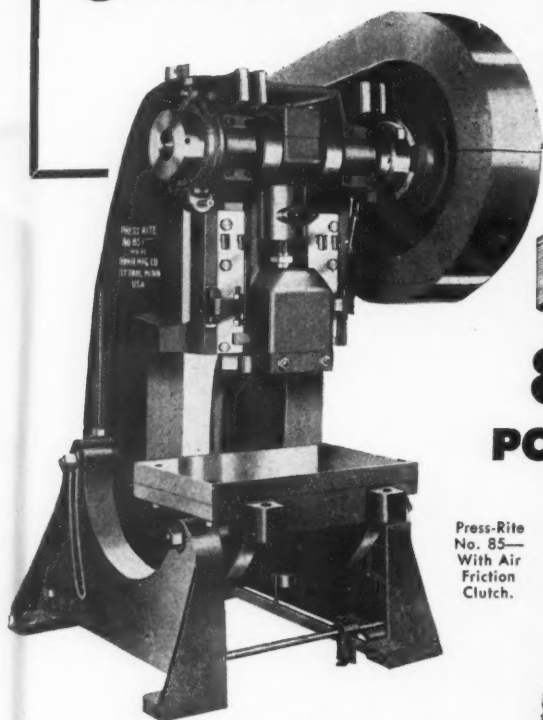
To solve your problems in drilling, boring, facing and tapping most economically . . . Call a NATCO Field Engineer Today!



Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

Convert . . . "DOWN TIME"
into
**PRODUCTION
TIME with . . .**

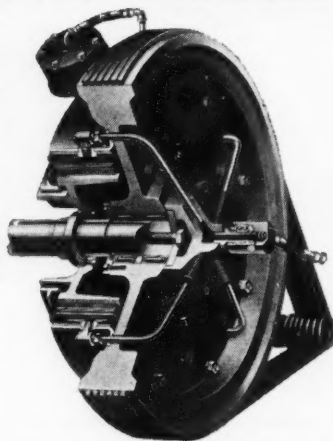


PRESS-RITE

OPEN BACK—INCLINABLE

**85-TON
POWER PRESSES**

Press-Rite
No. 85—
With Air
Friction
Clutch.



How many time tickets marked "down time" do your power press operators turn in? Added up, they'll show how press maintenance cuts into production time in your shop.

Users have proved that Press-Rite 85-Ton Power Presses can cut down time and boost production . . . per day . . . per machine . . . per operator. Among Press-Rite features making this record possible are:

- ★ Air Friction Clutch
- ★ Roller Bearing Flywheel
- ★ Extra Heavy Ramslide
- ★ Triple Ramway Lubrication
- ★ Uni-Cast Steel Frame—With Built-In Tie Rods

Each of these features is an important factor in reducing press maintenance . . . each is the job-proven end product of some of the top designers in the production machinery business.

**New! PRESS-RITE AIRFLEX
AIR FRICTION CLUTCH**
Practically eliminates maintenance!

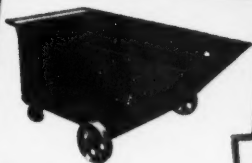
**Write For
Bulletin P-650,
Today!**

Sales Service Machine Tool Co.



2355 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

PS MATERIALS HANDLING EQUIPMENT



hand DUMP TRUCK

Reinforced heavy sheet steel, $\frac{1}{2}$ cubic yard, capacity—two 8" semi-steel wheels and two 4" metal swivel casters. Wt. 125 lbs.

Item NS-298 . . . \$5115

Item NS-364

Item B-704



SHEET STEEL GRAB

Handles sheet steel bundles, any size 0" to 9" thick, 18" to 48" wide and any length.



Item J-631
(1000 lbs.)
\$3180

Item J-632
(1 Ton)
\$3910



UNIVERSAL GRAB

For picking up heavy boxes, crates, bales or other loads where hooks may be used. Heavy, forged steel hooks adjustable spread of from 16" to 48".

Item
NS-288
\$6075

BARREL and BOX GRAB



For picking up any type of wood or steel barrel, box or container, from 40" diameter down to small nail keg size. Will lift up to 2000 lbs.



UTILITIES RACK on wheels

Item NS-415M . . \$6775
(Metal Wheels.)

Item NS-415R . . \$7020
(Rubber-tired Wheels.)

When Ordering
please give item
number. Prices
subject to change
without notice.

Item S-911P
Pneumatic
Rubber Wheels
\$4950



BARREL TRUCK

It Loads Automatically. Three style wheels: metal, rubber on metal and pneumatic. Capacity 1000 lbs. 22" wide for narrow openings. Weight 85 lbs.

Item S-911M \$3685
(Metal Wheels.)

Item S-911R \$4235
(Molded on Rubber Wheels.)

Palmer Shile Co.

PRODUCTION ON CENTERLESS GRINDER

multiplied 5 times per wheel-dressing

How to increase production is a matter of vital import in every plant in the country. Here's how one manufacturer licked the problem:

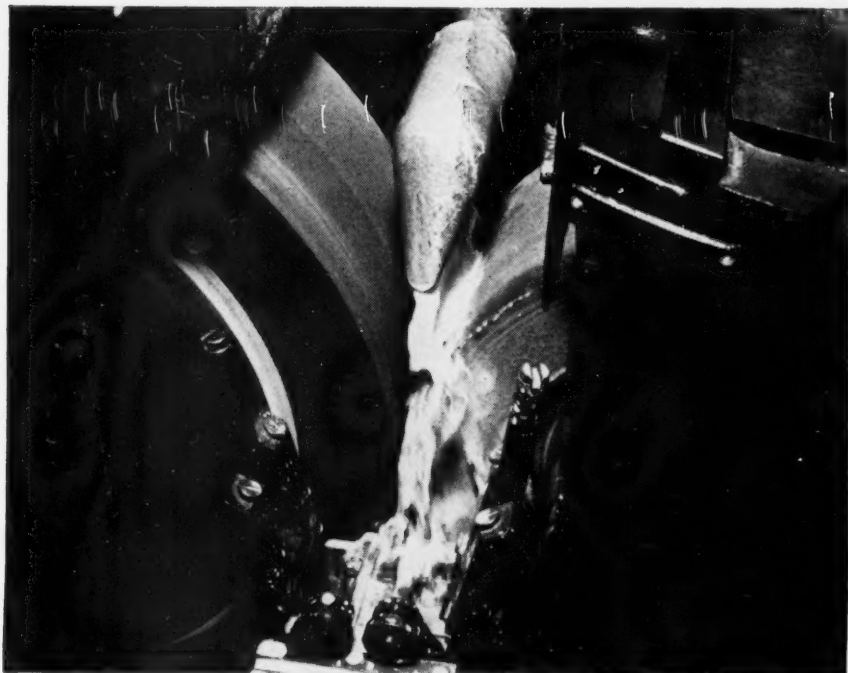
He had the job of manufacturing cotter-pin rivets for temporary bridge structures. In grinding these from drop forging, he was getting only 25 rivets per wheel-dressing, taking off 1/16" stock on a plunge cut. This was not fast enough.

A Robertson engineer was called in, and, after studying the prob-

lem, recommended a Robertson SA54-QV wheel. Production was increased to 125 rivets per wheel-dressing—an increase of 400 per cent.

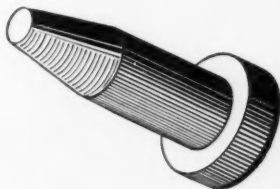
Whether you are working on steels of various analysis and hardness, on other metals, such as cast iron, brass, bronze, aluminum or on materials like Steatite or plastics, Robertson grinding wheels are designed to give you a combination of high production, quality finish and low cost.





One reason why a Robertson wheel was so successful in this application, as it has been in many others, is that we knew firsthand all the details of this manufacturer's problem. We were able, therefore, to give him a wheel of the proper grain and grade to do the job and do it right. Be sure to blueprint the full details of your problem when writing, and you will be sure to get a wheel that gives you a substantial bonus in production time.

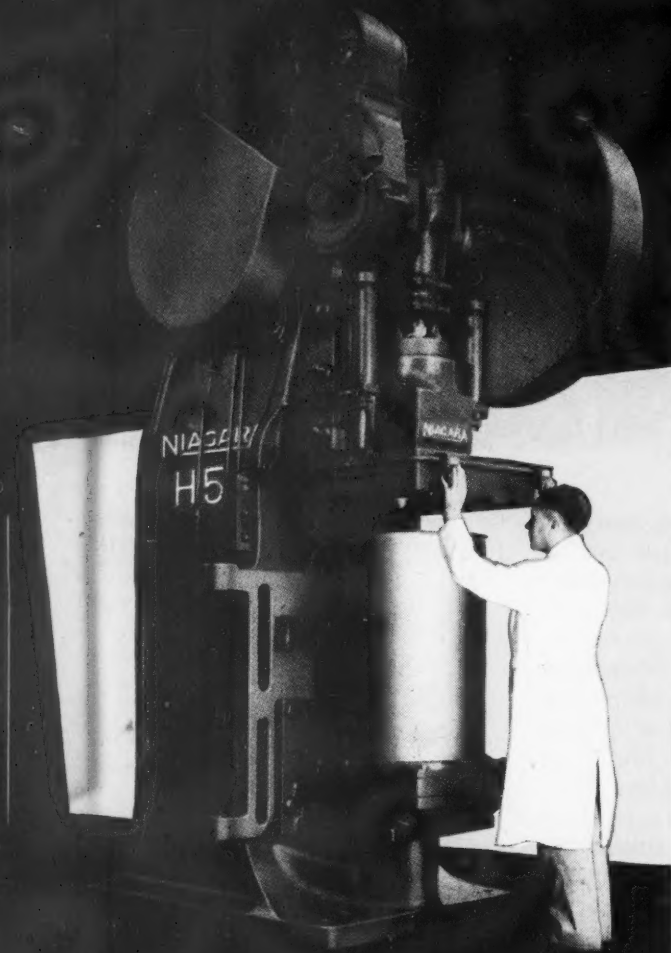
Cotter-pin bridge rivets were centerless-ground with Robertson wheels on Cincinnati No. 2 centerless grinders like the one shown in the photograph above.



ROBERTSON MANUFACTURING CO.
TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

NIAGARA



Niagara H-5 Geared Horn Press with air sleeve clutch and air releasing brake. Arranged with special table and dies for curling and flanging the ends of a 55 gallon 18-gage steel drum body.

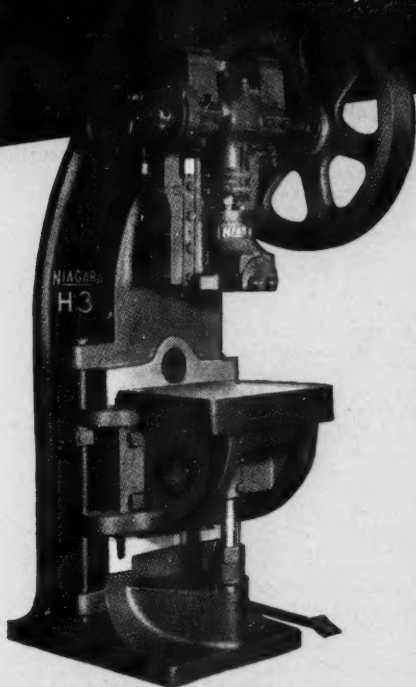
* In addition to ordinary blanking and forming work, these presses can be used for a variety of other operations requiring exceptional die height, such as curling, wiring and flanging container bodies. When fitted with a horn they can perform seaming, piercing, riveting and forming operations on the sides of formed shells.

Write for specifications on sizes to fit your requirements.

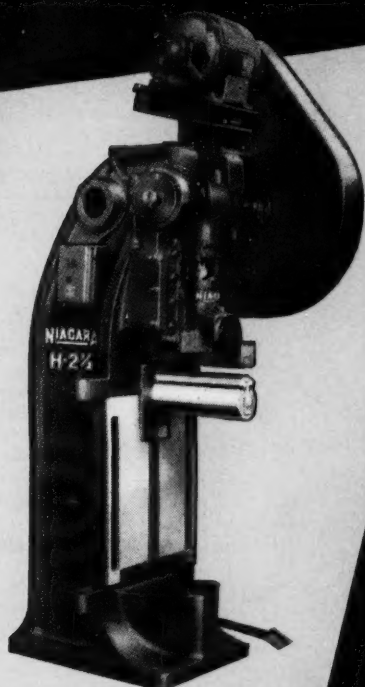
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

ADJUSTABLE BED HORN PRESSES

*offer Versatility for
Defense Production*



Standard Niagara H-3 Horn Press with swinging, screw-adjustable table.



Niagara H-2½ Horn Press with duplex side seaming horn.

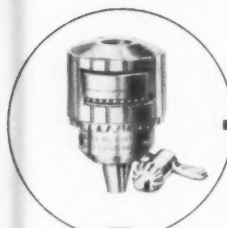
America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK

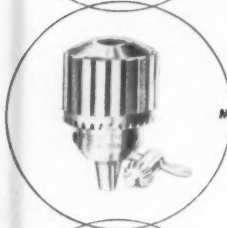
F

OREMOST IN CHUCKS...

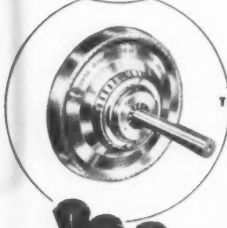
**Unmatched For Accuracy And Gripping Power,
Jacobs Chucks Are Vital Links Between
Power Tools And The Finished Job**



BEYOND ALL COMPARISON. Say "Jacobs Ball Bearing Super Chuck" and you've mentioned the last word in drill chucks. No other chuck ever made compares with this blue-chip wonder — in which Jacobs' famous ball bearing construction, tough alloy steels and precision workmanship combine for the tightest practical grip and great accuracy. That's why the Jacobs Ball Bearing Super Chuck is tops throughout the world for heavy-duty drilling.



MOST WIDELY USED DRILL CHUCK IN THE WORLD. Made of the same rugged materials and to the same close tolerances as the Jacobs Ball Bearing Super Chuck, the Jacobs Plain Bearing Chuck is particularly designed for portable tools and light and medium duty drill presses and lathes. Because of its matchless gripping power and accuracy it has been incorporated as standard equipment by the overwhelming majority of portable tool users both here and abroad.



THE WORLD'S OUTSTANDING LATHE COLLET CHUCK. Introduced less than two years ago, the Jacobs Spindle Nose Lathe Chuck has already gained sensational acceptance. Users who want the very best in machine tool performance are insisting on this chuck — thanks to its many improved features, including advantages never before obtainable in collet equipment. For example, there's the amazing capacity range of its collets, each of which closes through a full $\frac{1}{8}$ " range without the slightest loss of accuracy or gripping power. And only eleven Jacobs Rubber-Flex Collets are required to chuck bars of any diameter between $\frac{1}{16}$ " and $1\frac{3}{8}$ " — assuring exceptional savings over the cost of conventional chuck-and-collet equipment.



**THE JACOBS MANUFACTURING COMPANY
35 Jacobs Road, West Hartford 10, Connecticut**

FIRMEST IN GRIP

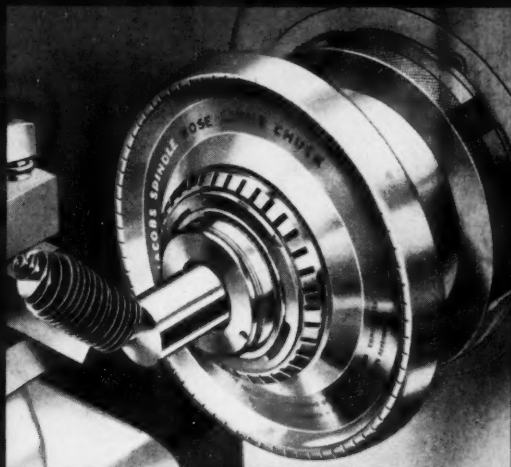


Jacobs Plain Bearing
Chuck



Jacobs Ball Bearing
Super Chuck

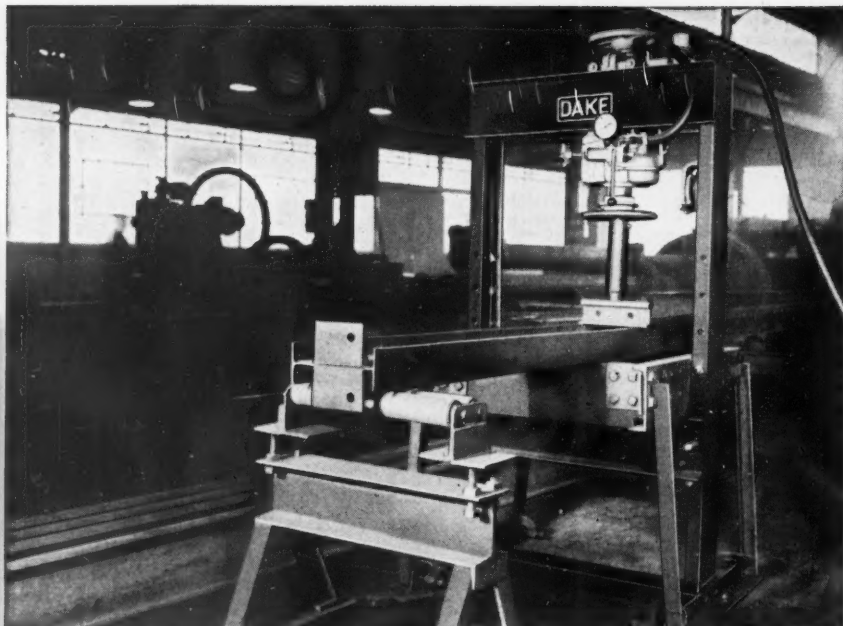
Jacobs Spindle Nose Lathe Collet Chuck



IF IT'S A

JACOBS

IT HOLDS!



Straightening Time Cut 66%

by Using a Standard Model Dake Press

When a steel fabricating company recently sought a faster way to straighten welded I-beams and channels, first reports indicated that special equipment would have to be built for the job.

Dake engineers advised otherwise: "By equipping our standard 50-ton air-operated press with a special table and screw nose," they said, "straightening costs should be reduced materially on all your structural work."

The company bought the press and

adapted it to the job. As a result... straightening time was reduced 66%, and the press paid for itself in the first two months of use.

If you have any kind of straightening, bending, or pressing jobs, consider a regular Dake Press first. Dake engineers will advise if your situation requires custom-engineered equipment.

The complete line of standard model Dake Presses is illustrated and described in a folder which we will gladly send you. Write for it, today.

Dake Engine Company, 612 Seventh St., Grand Haven, Michigan



Single
Leverage



Compound
Leverage



Hand-Operated
Hydraulic



Air-Operated
Hydraulic



Elec-Draulic



HOW TO PUT YOUR PLANT in the Pink

If your plant is suffering from painfully high metal cutting costs, prescribe CIMCOOL®! This revolutionary cutting fluid—this *chemical emulsion*—saves you money three important ways:

Rx CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.

Rx FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the coolant itself. Tools and chips actually stay cool to the touch.

Rx CIMCOOL COSTS LESS than old-fashioned coolants. It lasts longer, cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. Due to its low surface tension and low adhesion to work and chips, there is practically no carry off.

For a demonstration in one of your own machines, just write us. We'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat Off.

**A Production-Proved
Product of**

**THE CINCINNATI MILLING
MACHINE CO.**



for

85%

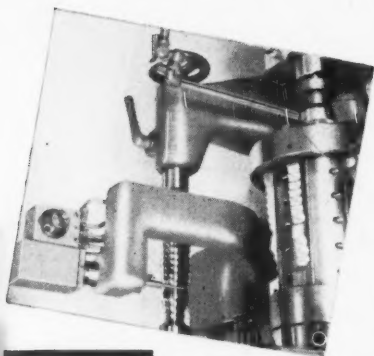
OF ALL METAL CUTTING JOBS

SAVED!

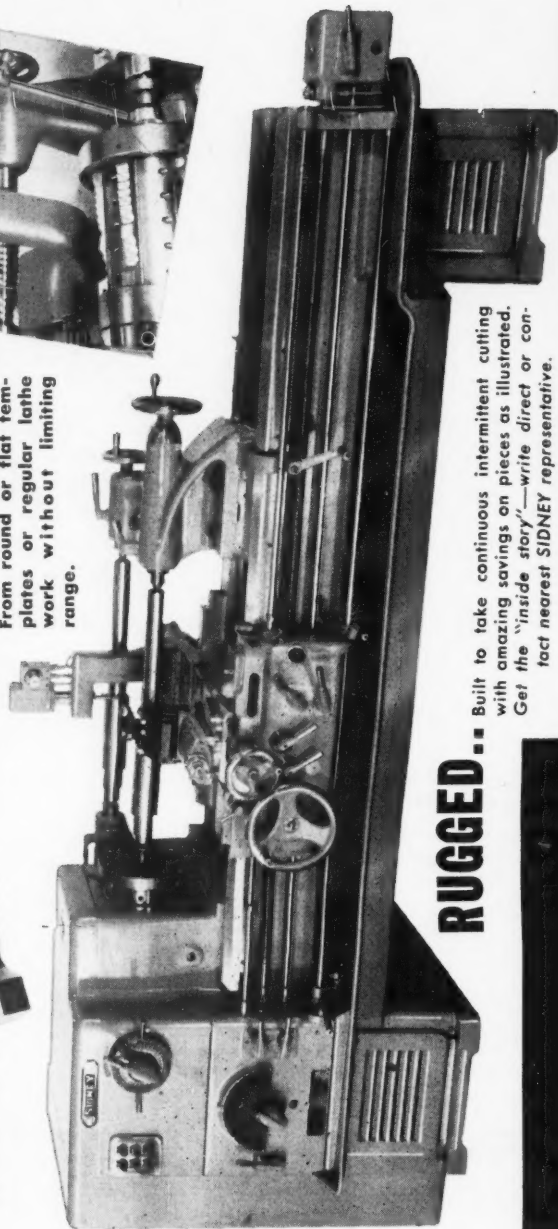
1 HOUR AND
55 MINUTES
PER PIECE

IN PRODUCTION
TIME-COSTS

**SIDNEY FLUID
TRACER TIME
ONLY 10 MINUTES**



From round or flat templates or regular lathe work without limiting range.



RUGGED..

Built to take continuous intermittent cutting with amazing savings on pieces as illustrated. Get the "inside story"—write direct or contact nearest **SIDNEY** representative.

SIDNEY HEAVY-DUTY
LATHES

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904

A New Machining Method *Saves* 4.07 HOURS ON EACH 100 PIECES

PORTER-CABLE ABRASIVE-BELT MACHINING

The Piece: Aluminum base plate for electric saw.

The Job: To grind a 45° bevel on one edge.

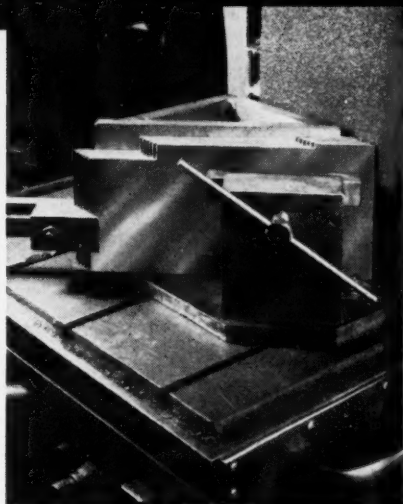
Previous Method: Plates beveled one at a time on milling machine. Production: 4.54 hrs. per 100 pieces.

Present Method: Work placed on Porter-Cable Wet-Dry Belt Grinder with Automatic Feed Table, Model BG8 — FT9. Simple fixture with one holding clamp holds six pieces. An 80 grit silicon carbide belt is used wet.

Result: Loading and unloading time cut 83%. Production: .47 hrs. per 100 pieces — a saving of 4.07 hrs. Extra bonus: 89¢ of each dollar spent on milling is saved!

Porter-Cable's BG8 Wet-Dry Belt Grinder often greatly steps up output of work now being milled, shaped, planed or wheel ground. Uses simpler fixtures . . . provides quicker set-ups — holds close dimensional limits. Large surfaces, especially those having a dispersed pattern of bosses, completed by one presentation to belt.

Send for free booklet — shows how Abrasive-Belt Machining speeds production. Reduces costs on many operations.



Abrasive Belt Machines for Every Application



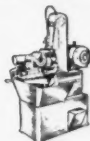
Platen Grinders



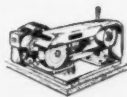
Contour Grinders



Flexible Belt Grinders



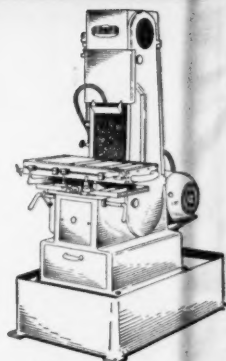
Centerless Grinders



Bench Grinders



Contact Wheel Grinders



Model BG8-FT9
(with Automatic Feed Table)

PORTER-CABLE MACHINE COMPANY
5071 N. Salina St., Syracuse 8, N. Y.

Please send me your free booklet: "Abrasive-Belt Machining."

Name.....

Address.....

City..... State.....

**Manufacturers of
SPEEDMATIC and GUILD
Electric Tools**

In Canada write: Strongridge, Ltd.
St. Catharines, Ont.

BIG '36' GEAR SHAPER cuts

- The quick assumption that a machine with 36" dia. x 6" face width capacity would not be efficient on small gears... **IS WRONG!**

Here is specific evidence
to the contrary: -----

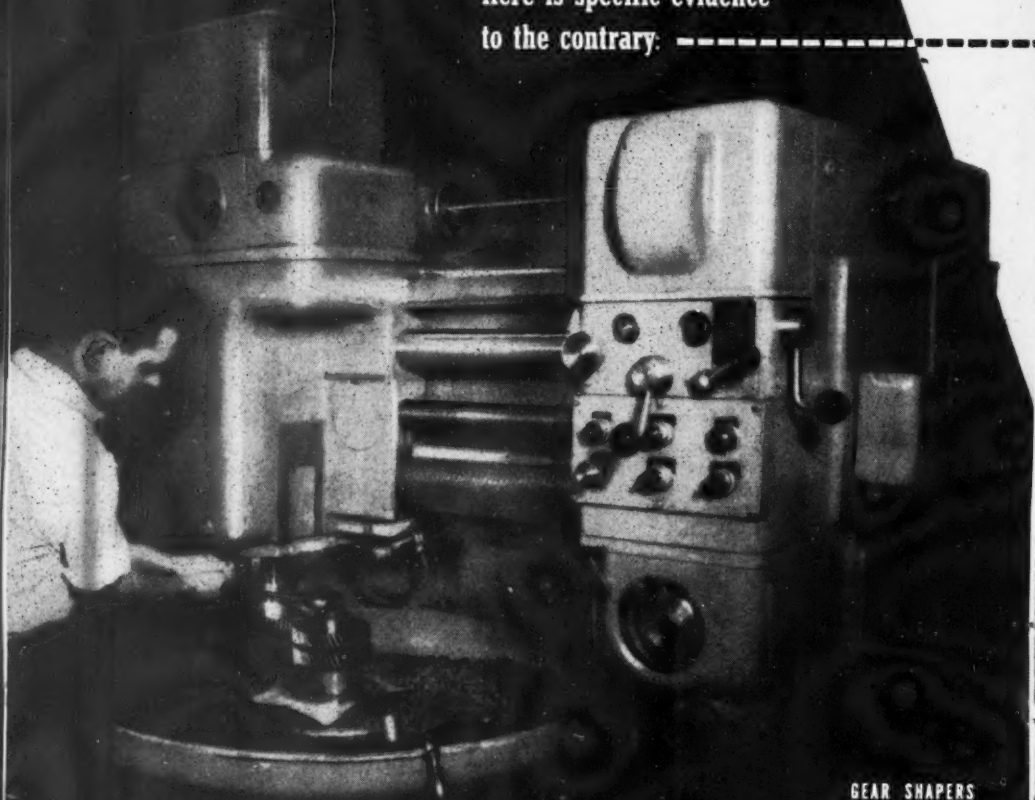


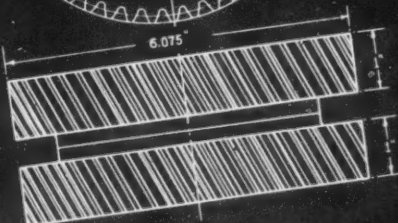
PHOTO BY COURTESY
NATIONAL ACME COMPANY
CLEVELAND, OHIO
*Makers of Multiple Spindle
Bar and Chucking Machines*

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

SMALL GEARS faster, too!

SPECIFICATIONS:

STEEL	SAE 4150
PITCH	8/10
PRESSURE ANGLE	20°
NO. OF TEETH	47
HELIX ANGLE	23°
TOOTH DEPTH	.235"



Cutting Time:

**10 Minutes .. on the new
36-Type Gear Shaper**

17.2 minutes by next best alternate method

24 minutes on still another machine

(all methods @ 2 gears per load, one cut)

This super-rigid big machine can take heavy cuts at high speed, and still hold fine finish . . . Work can be stacked up to 6" face width. Quick set-up, via shift-lever, dial-set and push-button controls. Choice of 12 cutter spindle speeds (18 to 300 strokes per min.) and 12 rotary feeds . . . The most versatile of all-purpose Gear-shapers! . . . *Contact our nearest representative for additional information. He will be glad to assist you in lowering your gear production costs.*

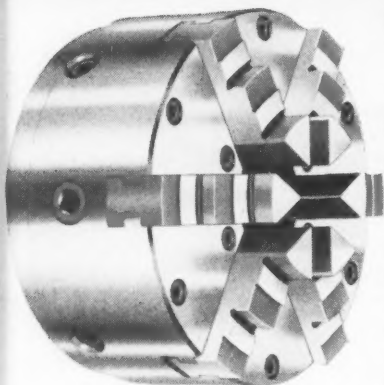
Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

Buck**AJUST-
TRU****CHUCKS**

WORTH \$1000

-COSTS ONLY \$106.50!



**.0005 PRECISION
WITHIN 1 MINUTE!**

Standard independent chucks, as you know adjust each jaw individually to center work. Buck Adjust-Tru scroll chucks use the jaws to grip the work (within .003), then center it by 4 opposed screws that work through the chuck body on the adapter. It's much quicker and permits machining duplicate parts (within .003) without further adjustment.

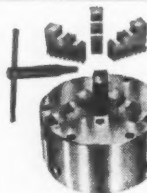
**THIS ONE 6 - JAW CHUCK
DOES THE WORK OF
\$1000 WORTH OF COLLETS
STUB ARBORS, MANDRELS!**

Hardly believable—yet absolutely true! This one Adjust-Tru 6" chuck is worth **ten times** its cost. You can put it to work on dividing heads, grinders, screw machines, lathes—line up dead true **in less than a minute**—rechuck duplicate parts as fast as a scroll chuck—and get **.005" precision every time!** Hole capacity is from $\frac{1}{8}$ " to 5". Automatically saves the cost of 93 collets, plus stub arbors, mandrels, etc. Automatically speeds production, saves machinists' time. This is just **part** of the story. Send for **all** of it.

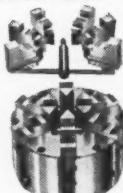
BUCK TOOL COMPANY

1114 Schippers Lane

Kalamazoo, Mich.



**3 STEP-JAW
CHUCK**
4 sizes—
4"—light
duty
5", 6", 7 1/2"—
heavy duty



**6 STEP-JAW
COLLET CHUCK**
4 sizes—
4"—light
duty
5", 6", 7 1/2"—
heavy duty



**6 JAW
PRODUCTION
COLLET CHUCK**
4 sizes—
4"—light
duty
5", 6", 7 1/2"—
heavy duty

ADAMAS

**...now has a complete range
of solid carbide inserts
in stock for you!**

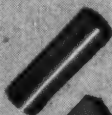
ADAMAS rounds out its line and brings you GOOD NEWS ON FAST DELIVERY for all of your finish ground solid carbide insert blanks and centerless ground solid cylinders, in a complete range of styles and sizes. Your orders will be shipped IMMEDIATELY from our large and adequate stocks, they're available in all of the standard grades for these styles of blanks.

Our new Stokes S-5—a high production press of the largest type in use in the carbide industry—ASSURES YOU of the USUAL PROMPT ADAMAS SERVICE in SC, TB, SQ, and RB style blanks.

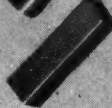
Smart carbide users always

Specify **ADAMAS TUNGSTEN CARBIDE**

for the triple advantages
of quality, delivery and price



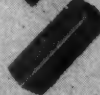
Style SC Solid Round Inserts
for Boring Tools, Insert Type
Tools, and wear parts



Style RB Rectangular for
Insert Type Tools, all finish
ground.



Style TB Triangulars for
Insert Type Tools



Style SQ Squares for
Insert Type Tools

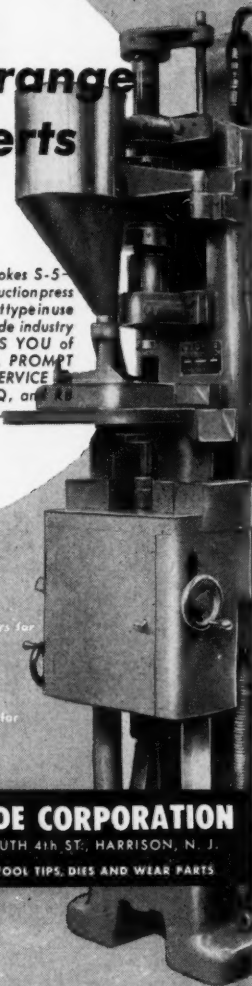
Send today for the NEW
ADAMAS CATALOG #A851
the latest "AID to CARBIDE
USERS"



ADAMAS CARBIDE CORPORATION

1000 SOUTH 4th ST., HARRISON, N. J.

PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS



PRECISION by the PILE



WITH

NAMCO

GROUND THREAD

CIRCULAR CHASER

VERS-O-TOOLS

When you use Vers-O-Tools, these workpieces are so typical that we lump them all together and measure them as precision in bulk. More properly, the samples of successful Vers-O-Tool work would be measured in terms of *tons*—for we've licked many a tough production problem: pressure-tight threads, dry-seal threads, API threads . . . and for all uses including aircraft, munitions, tanks, rockets, fine instruments as well as the usual commercial parts.

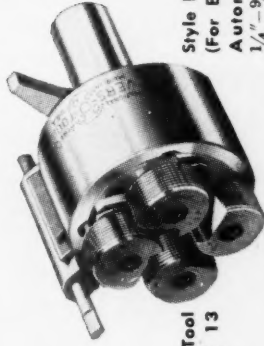
This is no ordinary success story. The selection of Vers-O-Tools for each of these applications is based on a proved-in-use record of superiority on each of three counts: accuracy and fine finish, longer tool life, increased production. These, in turn, stem directly from the Vers-O-Tool's unique design and construction features. For complete details on how Vers-O-Tools ground-thread-chaser can improve quality and cut costs in your shop, ask for catalog D-5L.



Style DS Vers-O-Tool
(Nonrevolving Type) 9
sizes, $\frac{3}{8}$ "— $\frac{47}{8}$ "



Style DR Vers-O-Tool
(Revolving Type) 13
sizes, $\frac{3}{16}$ "— $\frac{47}{8}$ "



Style DBS Vers-O-Tool
(For Brown & Sharpe
Automatics) 3 sizes,
 $\frac{1}{4}$ "— $\frac{9}{16}$ "

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and
Chuckling Automatics • Single Spindle
Automatics • Hydraulic Thread Rolling
Machines • Automatic Threading Dies and
Taps • The Chronolog • Limit, Motor Starter
and Control Station Switches • Solenoids
Centrifuges • Contract Manufacturing

SAY "GOODBYE"

TO BIG PROBLEMS WITH SMALL PARTS

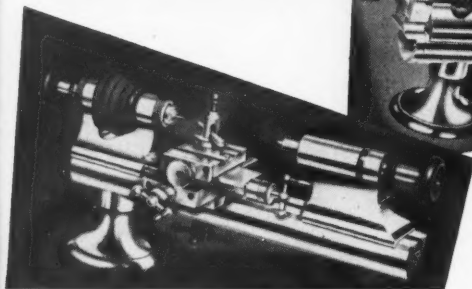
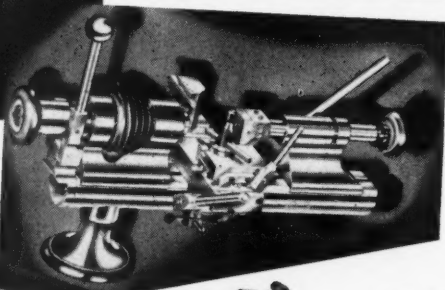
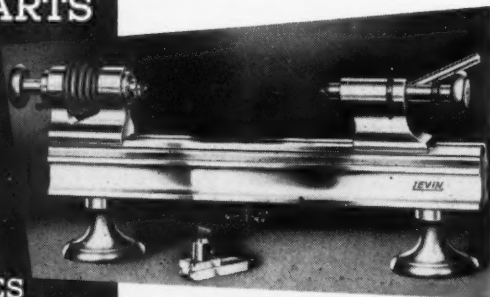
INVESTIGATE

LEVIN[®]

PRECISION
JEWELER'S LATHES,
ACCESSORIES AND
MICRO-DRILL PRESSES

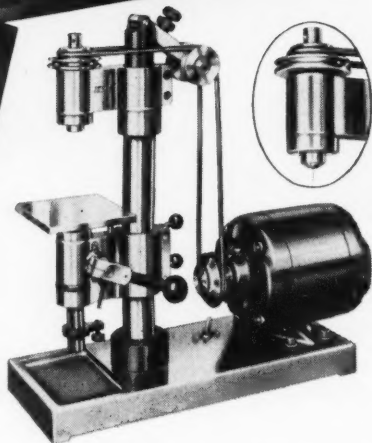
SEND FOR
COMPLETE CATALOG

Ideal for second operations or experimental work on small instrument parts where sensitivity is required. Releases expensive, larger lathes for more suitable work. Full line of accessories available.



An extremely sensitive drill press for very small drills down to .002". Drills held in accurate collets to minimize deviation. Spindle run-out less than .0001". Finger tip control enables operator to feel progress of drill.

LOUIS LEVIN & SON, INC.
786 E. Pico Blvd., Los Angeles 21



Wahlstrom Automatic Chucks "Essential to Operations"

at American Type Founders



"We have been using AMF Wahlstrom Fully Automatic Chucks for many years. They are essential to our operations," says James F. Stone, Production Manager at American Type Founders. Reason: Drills are changed while spindle is running.

One spindle can do the work of several for you, too, in drill press work... spotting, drilling and reaming in jig

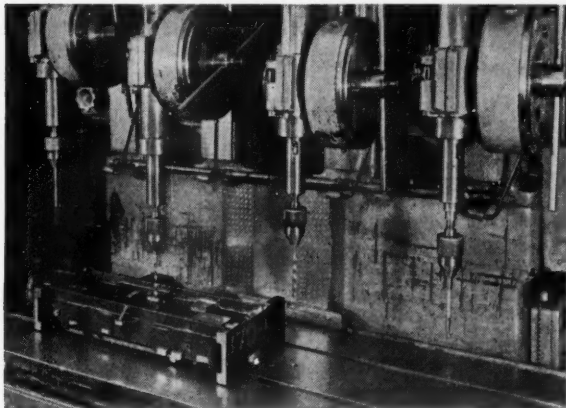
borers and millers...in lathe work for burring, turning and filing. See local distributor or write for Bulletin 56-1.

WAHLSTROM



fully automatic
CHUCKS

NO KEYS, COLLETS OR WRENCHES



Wahlstrom—only fully automatic drill chuck holding widest range of straight-shank tools—available in Model A (1/32" to 1/2"), Model AA (1/64" to 3/8"), Model B for larger straight-shank tools, Model C for taper shank tools, and fully automatic tappers.

WAHLSTROM TOOL DIVISION, AMERICAN MACHINE & FOUNDRY CO.
5502 Second Avenue, Brooklyn 20, N. Y.



ENGINE LATHES

High Quality

QUICK DELIVERY!

If your production is behind schedule and you are losing contracts because of your lack of machine tools, mail your Purchase Order today. We are starting with a clean slate and are accepting Purchase Orders now and are recording them in order of their receipt, with due consideration for priority ratings. Production of our new line will begin in January, with a 16" swing, high-quality improved Engine Lathe. Other sizes will follow as your needs are determined by Purchase Orders received.

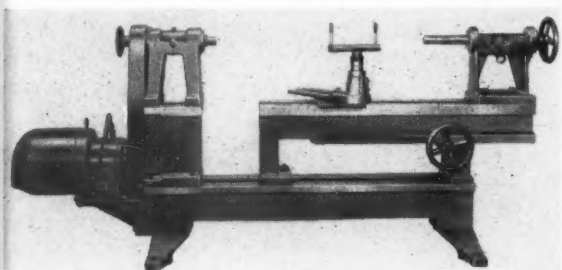
This new line of equipment will have improvements and inventions created by the corporation's president, Joseph A. Bedinger, well-known designer-inventor and tooling engineer, and will equal or surpass any engine lathe now manufactured. Send Purchase Orders to:

BEDINGER PRODUCTS CORP.

7554 GAYNOR AVENUE

VAN NUYS, CALIFORNIA

[Mr. Bedinger is the creator of the highly successful line of Metal Spinning Equipment featured below]



The BEDINGER Metal Spinning Lathe shown at left is available in 27" and 27" x 60" Gap Lathe for IMMEDIATE shipment from the factory.

Make and send Purchase Orders for BEDINGER Metal Spinning Lathes direct to our factory:

S. C. CARTER CO., INC.
1900 Santa Fe Ave.
Los Angeles 21, California

FEATURES:

- Only Metal Spinning Lathe made that can be converted to a Gap Lathe.
- 8-Speed Lima Drive, with High-Low Push Button Control.
- 2-Speed 5 H.P. motor, 1800-900 R.P.M., 220 v., 60 cycle, 3-phase, A.C.
- Bedinger Safety-Lock Tool Rest—cannot turn or slip.
- Combination Screw Tailstock.



USED BY: General Motors Corp. • Alcoa Aluminum Co. • General Electric Co. • Douglas Aircraft Co. • Lockheed Aircraft Corp. • Perfection Stove Co. • Ecko Products Corp. • Roland Teiner Co., Inc. • F. E. Olds & Son • C. A. Sweet Co. • Saxton Co. • and many others from Coast to Coast.

New STA-SHARP Diamond Tools

Save Time and Dollars!



Enlarged view shows STA-SHARP Diamond Tool. Phantom view above shows overlapping layers of selected small SOLID diamonds which are firmly locked in place in a special matrix by exclusive bonding process.

PATENT APPLIED FOR

**70 DIAMONDS
PER SQUARE INCH!**

STA-SHARP tools are NOT cluster diamond tools. They are made with many overlapping layers of fine quality, natural small diamonds. The cutting face of each STA-SHARP presents not less than 70 solid diamonds per square inch.

Cut your Diamond Costs by 50%

The diamonds in these new type dressing tools do not get dull. With the exclusive STA-SHARP design, as the top layer of diamonds wears down, the next overlapping layer comes into cutting position. The diamonds always do a good trueing and dressing job. That's why STA-SHARP tools require no turning, no periodic inspection, no supervision — which means a saving of valuable operator and machine time.

STA-SHARP tools are practically fool-proof. They are difficult to abuse—even through carelessness or incorrect use by inexperienced operators. STA-SHARP tools are not reset—they stay sharp to the very end. That's why they eliminate fading, dress wheels faster, make possible better finishes and produce more pieces between dressings.

Golconda Corporation

(Division of Super-Cut, Inc.)

3418 North Knox Avenue
Chicago 41, Illinois

Leading companies who have switched to STA-SHARP for their Centerless grinders report savings up to 50% on their diamond costs!

Send for Circular

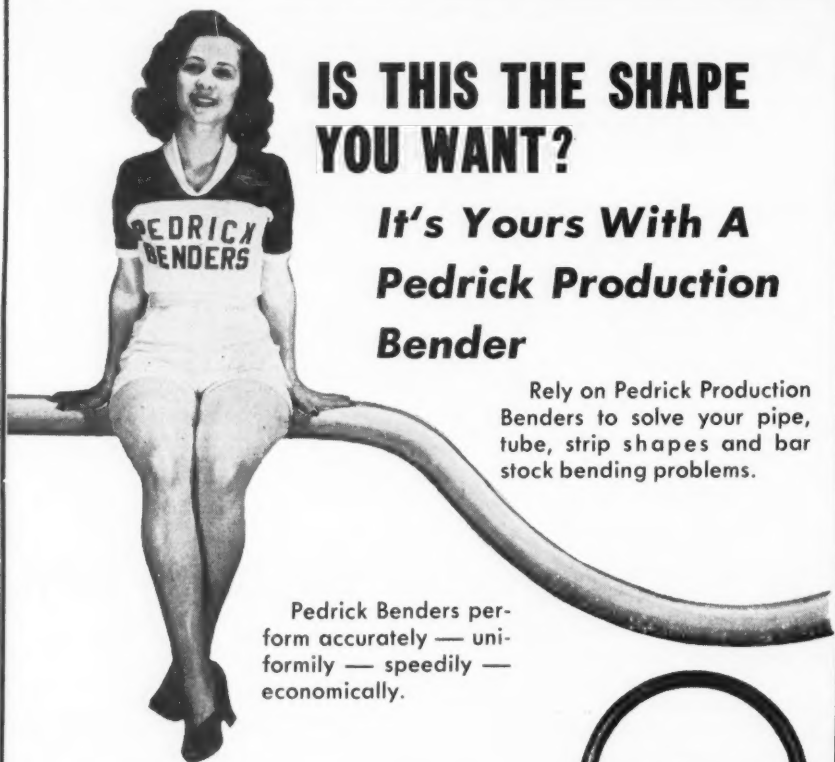
Mail coupon for special circular giving full details and prices on STA-SHARP Diamond Tools — also Catalog of complete line of Golconda Diamond Tools for every purpose.



GOLCONDA CORPORATION
(A Division of Super-Cut, Inc.)
3418 North Knox Ave.
Chicago 41, Illinois

Gentlemen: Please send me special circular of STA-SHARP diamond tools and complete catalog of Golconda Diamond tools.

Name _____
Address _____
City _____ Zone _____ State _____
Firm Name _____



IS THIS THE SHAPE YOU WANT?

It's Yours With A Pedrick Production Bender

Rely on Pedrick Production Benders to solve your pipe, tube, strip shapes and bar stock bending problems.

Pedrick Benders perform accurately — uniformly — speedily — economically.

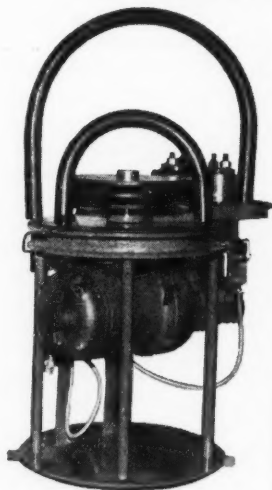
Equipped with relay controls for semi-automatic duplicate bending, Pedrick Benders will bend pipe up to 6" extra heavy — has no clamps—thereby eliminating many expensive tools. Pedrick machines require no previous experience, special skills, expert supervision. They are inexpensive—keep your costs low. If speed, accuracy, quantity, with quality, is your aim, write for descriptive folder.

PEDRICK TOOL AND MACHINE COMPANY

3638 N. LAWRENCE ST.

DEPT. 5

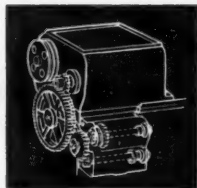
PHILADELPHIA 40, PA.



quick change artist

Reposition just 3 parts

Set up only two additional gears



**from English to metric thread-chasing* in about
ten minutes**



Simple straightforward steps arrange your Tray-Top light duty engine lathe to cut a full range of 48 metric threads and carriage feeds through the standard quick change box . . . quicker by far than for any other lathe, and more economical, too . . . What's more, you can change any of 12 spindle speeds (all geared, 40 to 1 overall ratio) in an instant, with 3-lever direct-reading color-match speed selector . . . And you can change setups because parking spaces on top of headstock and tailstock put mikes, tools, etc., at operator's fingertips, right where needed.

***required for
many defense items.**

Your Tray-Tops are indeed quick change artists. Operators spend no time figuring, more time getting work out. Make your next light duty lathe a Tray-Top.

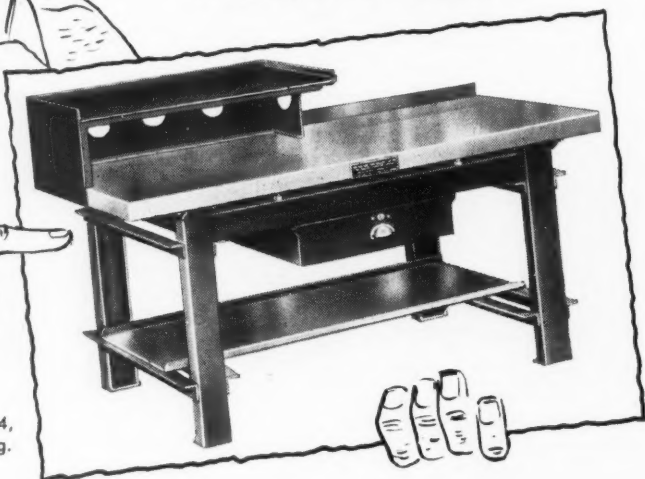
cincinnati lathe & tool co. ■ CINCINNATI 9, OHIO, U.S.A.

November, 1951

MODERN MACHINE SHOP 67



I CAN DO A BIGGER AND BETTER DAY'S WORK ON A CHALLENGE WORK BENCH



Four Sizes

28 inches wide x 4,
5, 6 or 7 ft. long.
Top 2" thick.

HERE'S WHY: Heavily ribbed, smoothly machined cast-iron top provides a "surface plate" . . . Table equipped with lock-leveling screws . . . Steel shelf in sturdy steel welded

base . . . Steel tool box shelf, guard rail, and drawer with lock . . . Vise and individual light can be easily attached . . . Bench is portable. Write for details.

666

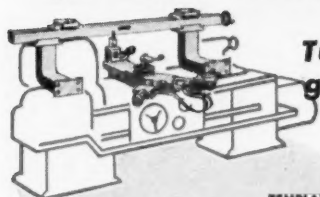
THE CHALLENGE MACHINERY CO.

Office, Factories,
Show Room

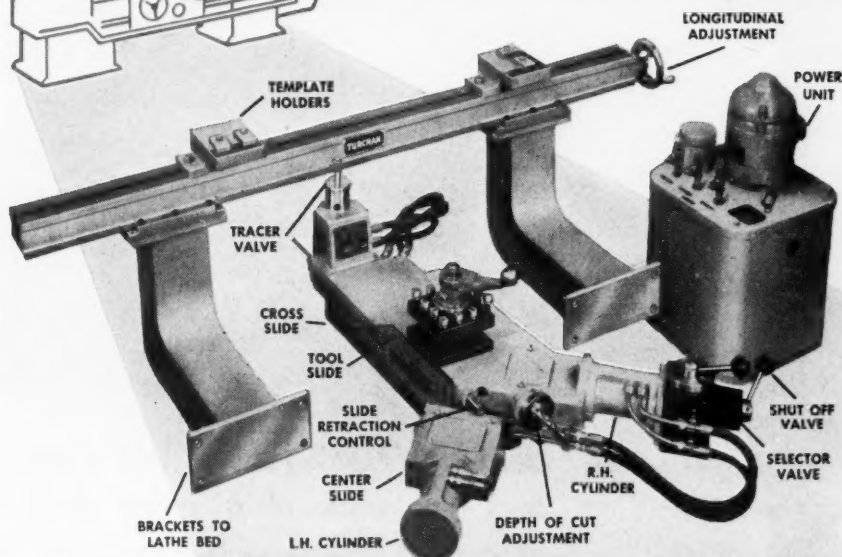


Grand Haven,
Michigan

Greatest advance in turning since the invention of the metal-working lathe



**Turchan hydraulic dual duplicator
gives 4 to 6 times faster production**

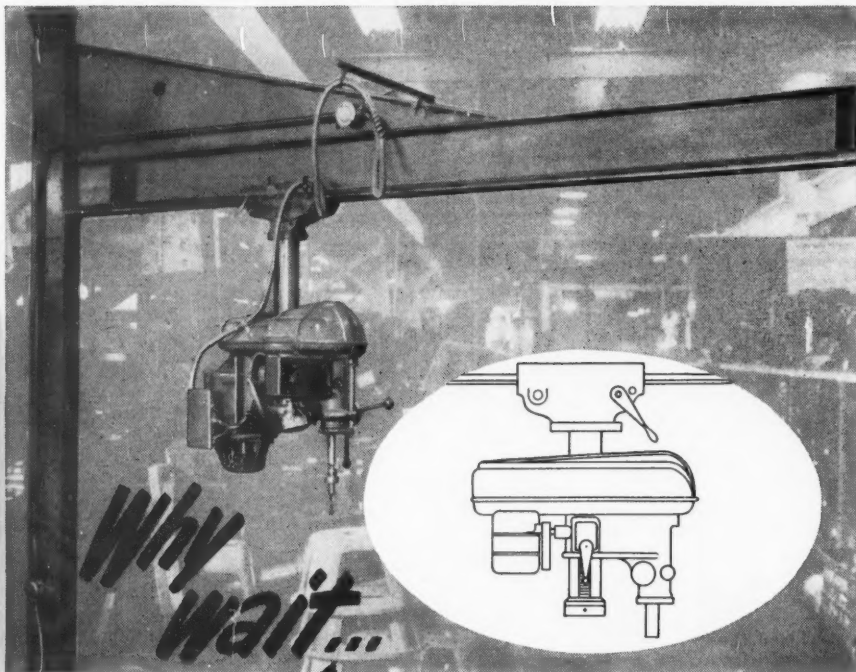


Just add this Turchan dual-turning follower to your standard lathes and watch the costs go down! No more need for costly special form tools. No skilled help required. Job set-up time can be cut to a small fraction. A cross slide equipped with two compounds at 45° to center line and 90° to each other replaces the conventional arrangement, allowing a new combination of movements. The 45° compound movements are controlled through a tracer, guided by template or full size

model, while the cross and longitudinal travels are obtained with the regular lead screws. This doubles tool approach to the work. Only one slide at a time is controlled by the tracer. Machining of right or left square shoulders, bevels, tapers, steps, undercuts, radii, and contour facing is easily accomplished. All this faster, more accurately (to .001"). Also other Turchan Followers for milling machines, planers, shapers and grinders. "Turn to Turchan to cut costs."

Turchan FOLLOWER MACHINE CO.
OLDEST MANUFACTURER OF "HYDRAULIC" ATTACHMENTS FOR MACHINE TOOLS

GET ALL THE FACTS — WRITE FOR DESCRIPTIVE BOOKLET



when a WALKER-TURNER Drill Head does the work of a radial drill!

There's no need to hold up part output because you can't get delivery on that radial drilling machine. A Walker-Turner Drill Head, as mounted in the photo (above), will do the work of a large radial drill.

Designed to work at all angles . . . to operate continuously and accurately at any speed from 400 to 2600 r.p.m., these flexible production tools can be readily adapted to your drilling requirements.

See your Walker-Turner Distributor at once. He has both 15" and 20" Drill Heads for immediate delivery. Take advantage of this opportunity to solve a production problem at relatively low cost.

SOLD ONLY THROUGH AUTHORIZED DEALERS

WALKER-TURNER

• DIVISION •

KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

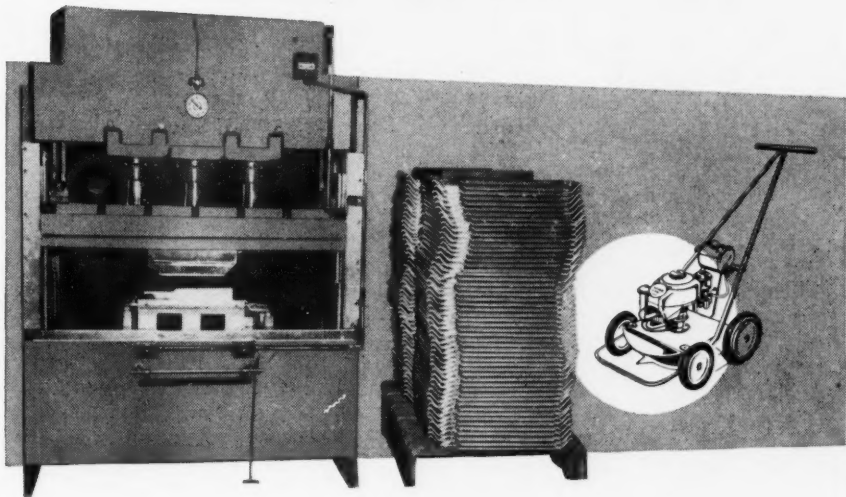
DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS • BELT and DISC
SURFACERS • METAL-CUTTING BAND SAWS • SPINDLE SHAPERS • JOINTERS

WORTHINGTON MOWER

trims costs by forming

deck plate frames in one operation

on K·R·WILSON press



The KRW 150 ton 3-cylinder hydraulic press, shown above, is set up to form *in one operation* the aluminum deck plate frames for Worthington's popular 18" Rotary Mower. The press is also used for forming sheet metal parts on larger Worthington Models 48 and 62. Officials of the company tell us "this press has been in constant use for nearly three years, both day and night shifts, on the blanking, piercing and forming of many of the larger parts going into our line of mowing equipment". There's proof of the versatility and rugged service you get with KRW Hydraulic presses.

Need hydraulic presses in your business? KRW has a full line available for *immediate delivery* in 25-150 ton capacities; one, two and three cylinder types; either hand operated, air operated or motor driven. You'll find that KRW hydraulic presses are the lowest priced on the market . . . and they do the Biggest day's work!

K R WILSON

215 MAIN ST.

BUFFALO 3, N. Y.

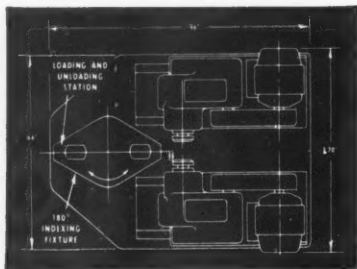
Ask your Machinery dealer to quote prices or write or wire Dep't 16

A New Concept - **DUPLEX PRODUCTION Milling Machines** as Developed by **MOTCH & MERRYWEATHER**



Great power and rigidity are transmitted at the tool point. Right-hand and left-hand milling heads rapid traverse approach, feed, and rapid return. The rotary index table carries two sets of workholding fixtures and is positively locked at the milling station. Here is the essence of rigidity.

M. & M. Duplex Production milling machines fit easily into conveyorized production lines. Parts are loaded and removed at one station. Production: 268 tractor side bars per hour at 100%.



General design of Motch & Merryweather Duplex Production Milling Machine.

With this Motch & Merryweather single-purpose production milling machine the two heads move, not the operator. There is no milling table to move. Let us tell you why greater rigidity and power (30 h. p.) will jump your production. Fixtures can be changed within certain limitations to suit your requirements. Your part drawings will receive our prompt attention.

Manufactured by

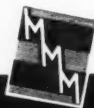
THE MOTCH & MERRYWEATHER MACHINERY COMPANY

715 PENTON BUILDING

CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT



SPRINGFIELD LATHES

on the PAYLOADER

Years of experience in applying engine lathes to the production of various parts for the world-famous

PAYLOADER

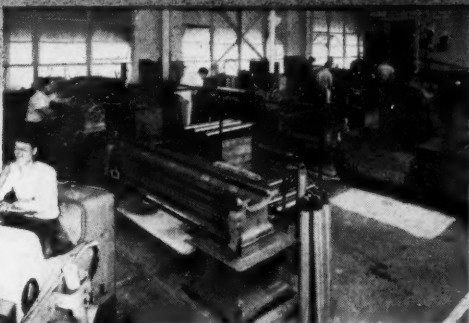
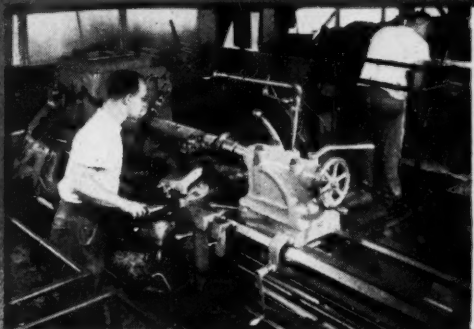
have convinced

The Frank G. Hough Co.,
Libertyville, Ill. SPRINGFIELD
LATHES are completely
satisfactory, extremely
versatile and productive.

On the basis of actual
records of their installations,
operator preference,
maintenance cost and
production study, The Frank
G. Hough Co. have placed
repeat order after repeat
order with SPRINGFIELD.

Benefit from the advanced
design, sturdy reliability
and production capacity of
SPRINGFIELD Lathes.

Ask for Catalogs.



THE **SPRINGFIELD** MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities



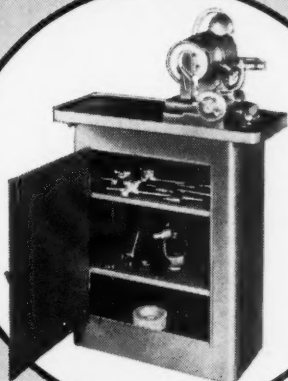
NOBLEWEST PRECISION MARKING DIES

for
MARKING
GRADUATING
NUMBERING
KNURLING
EMBOSSING
DEBOSSING

Noblewest makes dies for marking practically every type of surface, including round, flat, concave, convex and irregular contours. Noblewest dies are the finest that human skill and modern facilities can produce—*yet they are competitively priced.* Noblewest uses only specially selected steel, precision engraved to extremely close tolerances, and heat treated for extra long wear. Every Noblewest die is rigidly inspected and Rockwell tested for hardness. Large facilities permit prompt delivery. Send detailed specifications and we will gladly submit quotations. The Noble & Westbrook Mfg. Co., 25 Westbrook Street, East Hartford 8, Conn.



**Get more than twice the
usual life from your drills**



CABINET-PEDESTAL
Available for mounting
the No. 1-G Drill Grinder.
Made from steel with
wooden shelves. 31"
high from floor. 13" x
30" top.

*Gives even the smallest
drill a production point
that pays a profit*



**Eight times
more holes
per grind**

**Over 90%
saving in
drill cost**

**Among Heavy Machine
Tools built by
Consolidated are . . .**

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND
MILLING MACHINES
DRILL AND TOOL
GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

SELLERS NO. 1-G DRILL GRINDER WITH BALL BEARING SLIDE

This small, self-contained, bench-type grinder embodies the sound features that have conclusively demonstrated their superiority in the larger Sellers Drill Grinders. Foremost among which are the basic principles and inherent accuracy of the Sellers Chuck and the Sellers advanced method of drill grinding. This grinder produces the Sellers point on a single drill or an exact duplication on as many drills as are required. It grinds right hand 2 lip twist drills from .028" (No. 70) up to 1/2" diameter to any included angle of point from 80° to 160°. Designed with ball bearing slide, ball bearing swing frame and quick-adjusting tail center which combined provide increased accuracy, reduced wear and further simplification of operation and adjustment. Sellers Drill Grinders are built to last. Part replacements are negligible, however, if required, replacement parts are always available. Complete information will be furnished upon request.

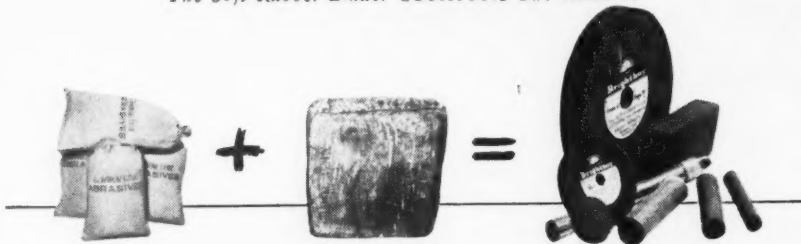
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS



**CONSOLIDATED
MACHINE TOOL CORPORATION**
ROCHESTER 10, NEW YORK

The Soft Rubber Binder CUSHIONS The Abrasive



Formula For

FASTER, FINER FINISHING

Burring • Cleaning • Finishing • Polishing

In One Time-Saving Operation

for PRODUCTS • ASSEMBLIES • PARTS

**in Lightweight and Semi-Precious Metals, Plastics,
Laminated Materials, Wood, Glass**

and the maintenance of machinery, tools, dies and mechanical equipment

Element Number One: Abrasive. Element Number Two: **RUBBER!** Skillfully compounded by Weldon Roberts, America's pioneer manufacturers of rubber-bonded abrasives, Brightboy brings you light finishing time-and-work savings.

The combination action of abrasive and rubber does it. The abrasive is completely and uniformly dispersed throughout the rubber binder, which also acts as a "cushion" for the abrasive. Rubber and abrasive, working together, create a unique action which in many instances bridges the gap between the rough grind and buff in one operation. Time savings can amount to fifty per cent!

**BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.**
6th Ave. & No. 13th St., Newark 7, N. J.
America's Pioneer Manufacturers of
Rubber-Bonded Abrasives



REG. U.S. PAT. OFF.

The simultaneous action of abrasive and rubber will achieve a wide variety of finishing effects, the desired surface being obtained by speed and/or pressure of the Brightboy wheels, sticks, rods or blocks used in machine or manual operations. Brightboy will work to close precision-tolerances and can be shaped to curved surfaces and contours. Requires no before-use dressing or preparation; no skilled labor to handle it.

A Brightboy finish often constitutes the final polish. Brightboy's general uses include removing light digs, tool and heat marks, cleaning welded and soldered joints, finishing and burring dies, molds, stampings, machined parts.

Get a few test-pieces of Brightboy from your dealer. Try them. Write the Brightboy Service Department on any problem where finishing is involved.

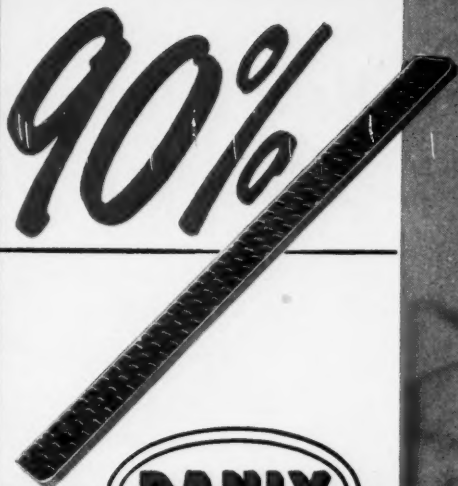
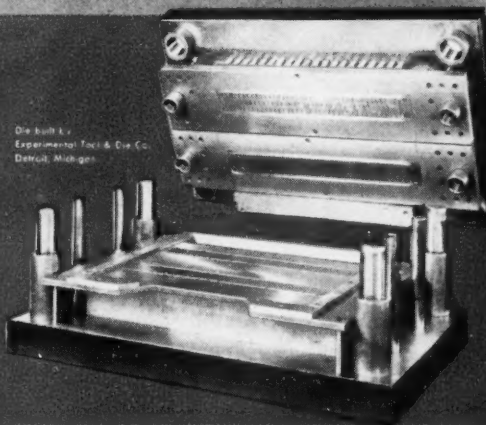
HAVE YOU A DEFENSE CONTRACT?

Investigate the wide adaptability of Brightboy, already proved in the manufacture and maintenance of Ordnance, Internal Combustion and Jet Engines, Airplane Parts, Electrical and Electronic Equipment, Transportation Equipment — and for the production of basic tools, dies, molds, jigs, patterns, etc.

PIECE PART REJECTIONS REDUCED

Diemakers at Experimental Tool & Die Company solved a costly repair soldering problem on these stamped radiator heads with the die shown below. Precision was the secret. Die tolerances were held to within .0001" and all die components had to be interchangeable. That's why they specified . . .

Die built by
Experimental Tool & Die Co.
Detroit, Michigan



DIEMAKERS' SUPPLIES and PRECISION DIE SETS



Die Sets



Stripper Pins



Die Springs



Cap Screws



Stripped Bolts

CALL ON THE DANLY BRANCH CLOSEST TO YOU FOR FAST LOCAL SERVICE

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- *CLEVELAND 14, 1530 East 39th Street
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- *INDIANAPOLIS 4, 5 West 10th Street
- *LONG ISLAND CITY 1, 47-28 37th Street
- *LOS ANGELES 34, Ducommun Metals & Supply Co.,
4890 South Alameda
- *MILWAUKEE 2, 111 East Wisconsin Avenue
- *PHILADELPHIA 44, 18 West Chelton Avenue
- *ROCHESTER 4, 16 Commercial St.

*Indicates complete stock

Diemakers everywhere depend on Danly precision. Every Danly product—die sets, dowel pins, die springs, cap screws, stripper bolts—is designed to complement the finest die work. For complete, reliable service, come to Danly!



DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

Here come the **NEWEST** **Stanley Drills!**

1/4" SIZE

HEAVY DUTY



No. 168



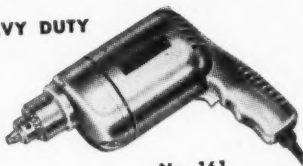
No. 169

5/16" SIZE

HEAVY DUTY



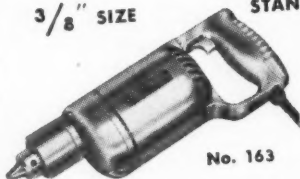
No. 160



No. 161

3/8" SIZE

STANDARD DUTY



No. 163



No. 165



Six brand new drills — all with the famous Stanley name. They're streamlined beauties, packed with surplus power.

Outstanding features include: polished aluminum housing, locking trigger switch, ball bearings, geared chuck, removable chuck guard.

See them at your dealer's, or write for folder. Stanley Electric Tools, 416 Myrtle St., New Britain, Conn.

STANLEY

Reg. U.S. Pat. Off.

HARDWARE • TOOLS • ELECTRIC TOOLS • STEEL STRAPPING • STEEL

JIG GRINDING ACCURACY *guaranteed**



INFINITE CONTROLLED SPEEDS 30,000 TO 65,000 R. P. M.

Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

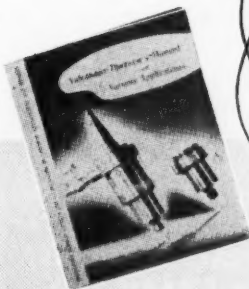
**Dependably accurate to "tenths"*

Other infinitely controlled air driven spindle applications

Place spindle on most any machine. Use it for finishing contours on hardened steel working surfaces . . . burring or milling die castings . . . routing wood contours . . . carbide milling or finishing slots . . . finishing holes in hardened steel to "tenths" . . . grinding with diamond wheels, carbide burrs, or diamond impregnated mandrels.

Advantages—10 micro finishes using carbide mills . . . 5 micro finishes using mounted points, operates at any angle . . . air driven, air cooled, overheating prevented . . . speed controlled at optimum point . . . 3 1/4" long motor uses little working space . . . By controlling speed at any point you abolish need for many constant speed spindles.

For immediate quotation please state machine tool application. Get this manual of photos showing operations Vulcanaire performs.



Vulcanaire

BUILT BY TOOLMAKERS FOR TOOLMAKERS

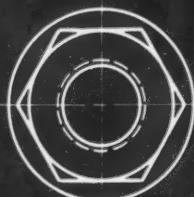
VULCAN TOOL CO.

731 LORAIN STREET

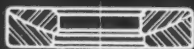
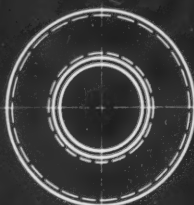
DAYTON 10, OHIO



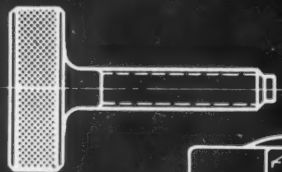
KNOB SHOE ASSEMBLY



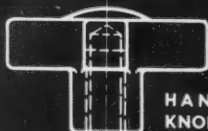
FLANGE NUTS



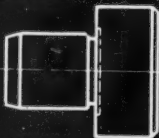
SPHERICAL WASHERS



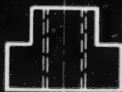
ADJUSTING
HEAD SCREWS



HAND
KNOBS



REST BUTTONS



T-SLOT NUTS

STANDARDIZE

with

WESPO

STANDARD FIXTURE PARTS and FITTINGS



The cut shows a few of the 350 parts and fittings which are used by leading manufacturers to save time and money formerly spent in designing and machining.

WESPO parts are precision manufactured of quality steel—heat treated and rust proofed. They are made for heavy duty and long usage and have proved their value in many industries.

OVER 350 PARTS AVAILABLE

This wide variety of types and sizes makes it easy to use WESPO parts for almost any of your fixture needs. TEMPLATE DRAWINGS OF ALL PARTS ON REQUEST. Write for catalog.

WEST POINT MFG. CO.

26931 West 7 Mile Road

Detroit 19, Michigan

TEMPLATE DRAWINGS
OF ALL PARTS FREE

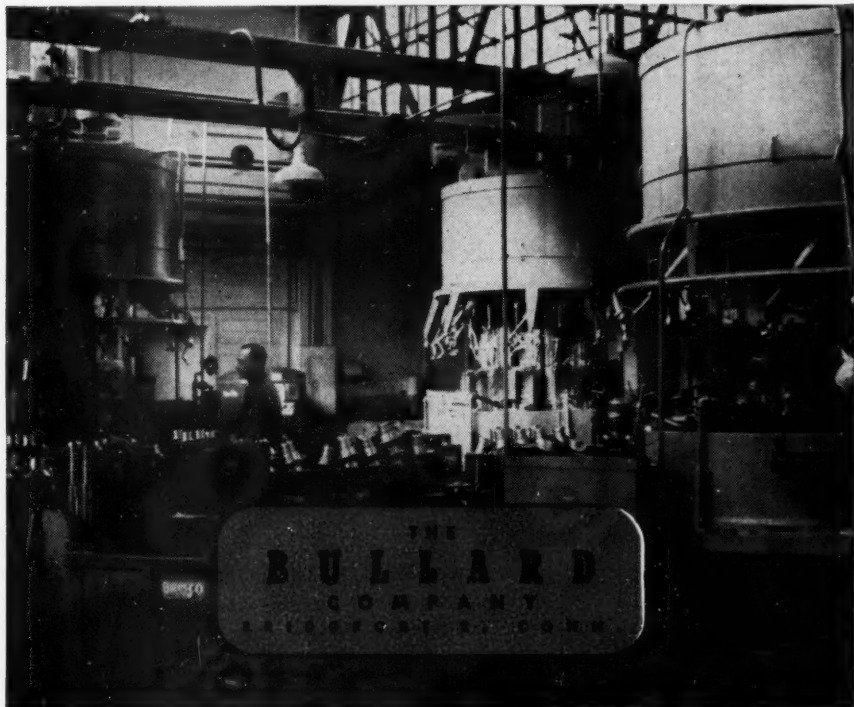
KEEPING  PACE WITH TIME . . .

Bullard Mult-Au-Matics

*at Spicer Manufacturing Division of
Dana Corporation, Toledo, Ohio*

Some 30 Mult-Au-Matics — eight spindle type, in 12 and 16 inch sizes, produce a variety of automotive parts. Naturally these machines were installed because of their productive capacity. Since, one Mult-Au-Matic produces the equivalent of three former machines which it replaced. Furthermore, the customer expressed satisfaction with the dependable performance of these machines and remarked on the economies possible with Mult-Au-Matics.

Write BULLARD for Factual Time Savings on your Jobs



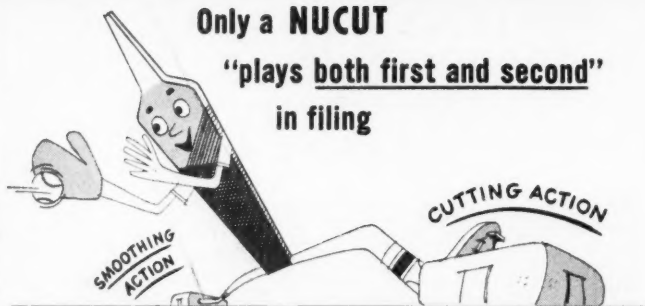


HELLER

NUCUT WAVY TEETH FILE

Only a NUCUT

"plays both first and second"
in filing



1st. CUTTING ACTION

2nd. SMOOTHING ACTION

At every stroke

It's like using two files instead of one when you work with a NUCUT. For a NUCUT has *two* sets of teeth — one coarse, the other fine... scientifically positioned in a patented wavy pattern.

And what a difference this exclusive construction makes! The coarse teeth bite fast, clean, without scraping or skidding. The fine teeth smooth the surface *with the same stroke*. Result: better filing, faster, with less effort.

See your industrial distributor. He'll show you the sizes, shapes and cuts for getting the best results on *your* work.

HELLER BROTHERS COMPANY

America's Oldest File Manufacturer

Newcomerstown, Ohio

CONTACT YOUR INDUSTRIAL DISTRIBUTOR for our FULL LINE of American Pattern, Swiss Pattern, Milled Curved-Tooth and Rotary Files, Rasps, Machinists' and Carpenters' Hammers, Blacksmiths' and Farriers' Tools, Bricklayers' and Plasterers' Trowels, Craftmaster Scrapers, Chisels, Punches, Masterrenches and other quality tools.



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SPRING CLAMP



"C" CLAMP



NO. 640 "1" BAR CLAMP



QUICK CLAMP



HAND SCREW



**HARGRAVE
CLAMPS**


HARGRAVE
Tested Tools

**THE CINCINNATI
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**PREFERRED BY INDUSTRY
FOR 71 YEARS**

"A Clamp For Every Purpose"

Also a Complete Line of —

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PUNCHES

STAR DRILLS

BRACE WRENCHES

MASONRY DRILLS

WASHER CUTTERS

THE CINCINNATI TOOL COMPANY

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There is an Industrial Distributor stock near you



OLD FASHIONED METHODS

Work, but — *Slowly*

Modern Production

Calls for

EFFICIENCY with Speed

Maintain Production Schedules Equip **YOUR Tool Room with** **OLIVER DIE MAKING MACHINES**

Meet accelerated production demands at lower production costs with OLIVER Die Making Machines. Their efficiency, speed and accuracy, effect time and cost savings up to 60% — and skilled labor is not required. Innumerable plants throughout the Nation are employing thousands of OLIVER Die Making Machines (many in continuous use for more than 25 years) for sawing, filing and lapping operations . . . Be Wise, OLIVERize — Use OLIVER Die Making Machines.

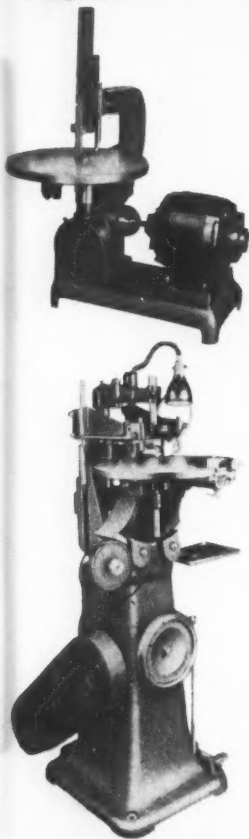
OLIVER DIE MAKERS

Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today for Complete Technical Data.



OLIVER INSTRUMENT CO.

1430 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL
POINT THINNERS—TEMPLATE
TOOL GRINDERS—FACE MILL
GRINDERS—DIE MAKING MACHINES

**For Precision
Between Centers**

EX-CELL-O

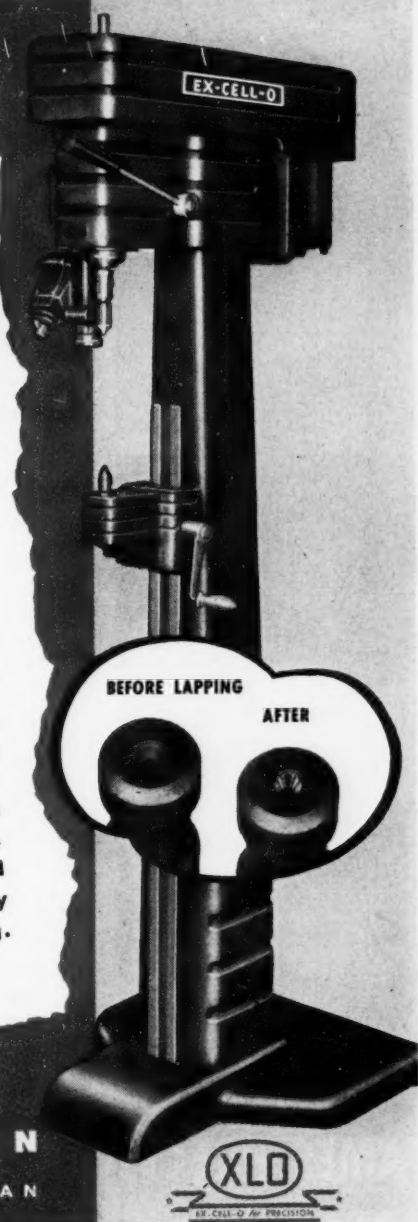
CENTER LAPPING MACHINES

Meeting today's precision standards requires careful checking of every phase of the job, including the center holes in the work. Ex-Cell-O Center Lapping Machines correct inaccuracies of center holes that affect the quality of all subsequent operations performed between centers. These machines are precision built and are easy to operate. They are fully described in Bulletin 40271—a copy is yours for the asking.

**EX-CELL-O
CORPORATION**

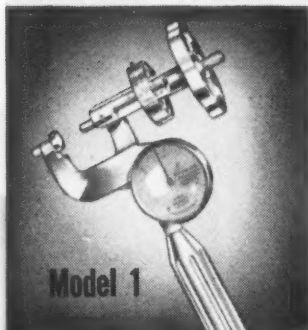
DETROIT 32, MICHIGAN

31-19



Ames PRECISION HARDNESS TESTERS

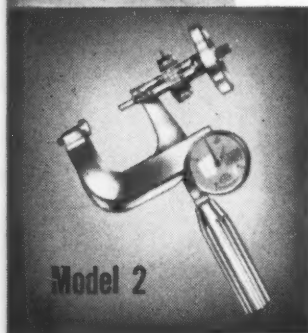
FOR ROCKWELL HARDNESS TESTING



Today, hardness testing is a necessity in the working and fabrication of metals. Ames Portable Hardness Testers save an amazing amount of time by going to the work. No laboratory testing. No delays. No cutting off specimens. Anyone can get accurate readings directly in the Rockwell Hardness Scales easily and quickly.

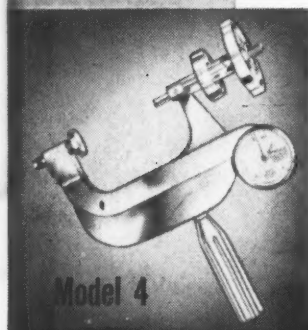
Model 1 Hardness Tester

For testing round and flat stock, tubing, saws, knives, etc., up to one inch in Rockwell A, B and C Scales. Weighs only 1½ lbs.



Model 2 Hardness Tester

For testing rounds and flats, dies, odd-shaped pieces, etc., up to two inches in Rockwell A, B and C Scales. Two inch throat depth. Weighs 2½ lbs.



Model 4 Hardness Tester

For testing up to four inch capacity directly in Rockwell A, B and C Scales. Throat depth two inches. Taken to the work for accurate, on-the-spot tests. Weighs 3¼ lbs.

Send for descriptive literature.

AMES PRECISION MACHINE WORKS
WALTHAM 54, MASS.



some steels
are pampered pets

These are the special purpose steels that are Crucible apart from most other steel companies. For these special steels must be so carefully compounded, and so sensitively finished that, in most cases, they cannot be mass-produced.

Such steels include those designed for use under severe conditions of heat or cold, stress, strain, or wear. For example, Crucible high speed tool steels are in the whirling machines that cut and shape the toughest metals. Crucible ball-bearing steels work around-the-clock digging mines and quarries, and Crucible stainless steels put a sparkle with a purpose in our kitchens.

If you have an application that calls for a special steel, Crucible's metallurgical staff stands ready to help you. CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

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51 years of *Fine* steelmaking

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some steels

are pampered pets

especially tool steels!

Crucible Tool Steels have been pampered pets every day of the 51 years Crucible has led in this highly specialized field. That's why tool steel users, assured of getting what they want from Crucible, have kept us the country's number one tool steel producer.

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That's why it pays to get *all* your tool steel needs from Crucible.



*write for your
selector today*

If you haven't gotten your handy tool for selecting tool steels, write: Dept. MS, Crucible Steel Company of America, 405 Lexington Avenue, New York 17, N. Y.

CRUCIBLE

first name in special purpose steels

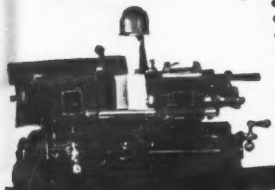
51 years of *Fine* steelmaking

TOOL STEELS

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Want to reduce
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50%? 59%?
— even 75%?

BLAKE
TAP SHARPENING
EQUIPMENT
DOES THIS
FOR OTHERS



No. 6 in a continuing study
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Equipment.

TAP PERFORMANCE

Before Sharpening Averaged only 600
holes per tap when tapping 10-32,
5/16" deep through hole (Class #3 fit)
in die cast aluminum. Standard 2-flute
Commercial Grd. spiral pointed tap
used.

After Sharpening on Blake Equipment
Tap reground with 18° hook in flute
and spiral point increases tapped holes
per grind to 12,000 — an increase of
2000% *per grind*. Average six grinds
per tap before it is discarded as too
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Total holes per tap: 72,000.

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To get dollar-for-dollar value from your
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do other cutting tools. The Blake Flute
Grinder and the Blake Chamfer Grind-
er provide you with fast, accurate, and
economical means for grinding straight
flutes, spiral points, and the chamfered
ends of your taps — a sure means of
reducing your tap bill.
Investigate today.

Ask for Bulletins 549 and 649

EDWARD BLAKE COMPANY

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• Rugged, High Powered and Versatile, Mattison Precision Surface Grinders with double-column construction are built to handle your grinding jobs on a real production basis, providing repeated precision results and a fine finish. They are built with table sizes from 12" to 36" wide by 56" to 192" long.

WIDE ABRASIVE-BELT GRINDING and POLISHING MACHINES

• From the time factory coated abrasives were introduced for metal polishing and grinding, Mattisons have developed and built machines properly applying belts to do the job to be done. The Wide-Belt Wheel Grinder and Polisher shown above is for finishing stainless steel and alloy steels in sizes up to six feet wide and six feet long.

MATTISON

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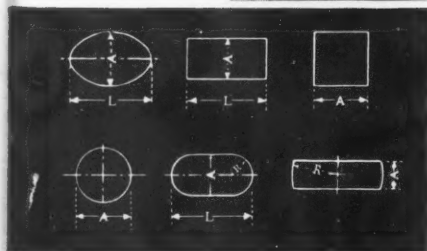
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PUNCHES and DIES

Prompt shipment from stock of any of the 400 sizes of the standard Round Cleveland Punches and Dies is assured. What's more . . . you save because of quantity stock production.



Special punches and dies for all these shapes.

For convenient ordering, write for Cleveland Hand Book No. 11 covering our line of small tools: Punches, Dies, Coupling Nuts, Sleeves, Rivet Sets, Pistons, Chisel Blanks, Markers, Pins and Shear Blades.

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Established 1880

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FABRICATING TOOLS

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SPEEDY AIR VISE

SPEEDS UP

✓ MILLING

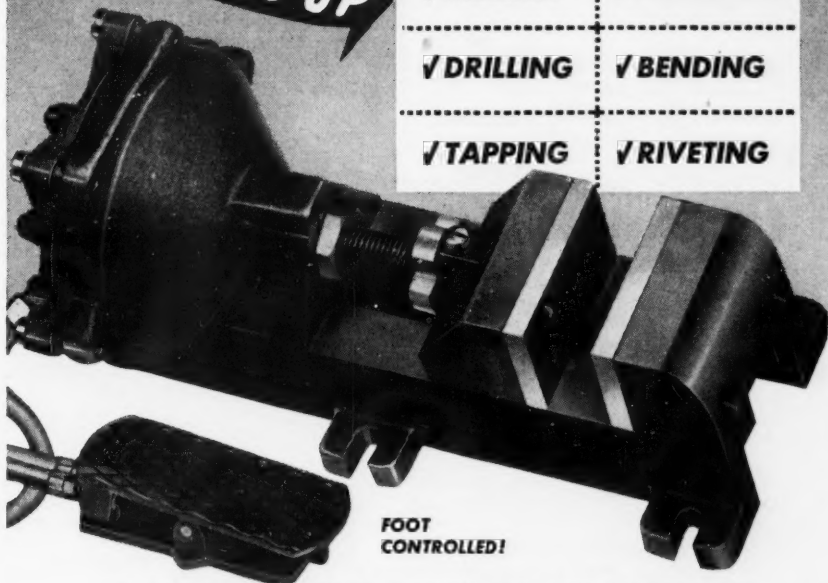
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✓ DRILLING

✓ BENDING

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✓ RIVETING



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CONTROLLED!**

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operates
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Tool Saving Tips

#3 OF A SERIES

**USE
KENNAMETAL
MECHANICALLY
HELD TOOLS**

SAVE STEEL

Solid heat-treated shank resists chip erosion—serves as permanent tool holder

SAVE INVESTMENT

Tool is suitable for cutting variety of metals, by using insert of proper Kennametal grade

SAVE GRINDING WHEELS

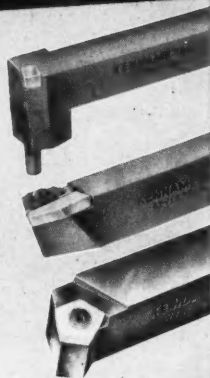
Grinding is simpler—less frequently required. No steel to grind

SAVE CARBIDE

Mechanical-holding prevents brazing strains—insures best service from Kennametal

SAVE "CRITICALS"

The mechanically-held technique enables you to get the best possible service from all tooling elements, thereby conserving materials, machine-time, and man-hours



HOW TO S-T-R-E-T-C-H KENNAMETAL INSERTS

When Kennametal inserts have been reground many times and have become too short for effective clamping, simply braze two "used" pieces end to end as shown. This permits proper clamping . . . and because Kennametal inserts are uniformly sound from top to bottom you get much more work from each insert.



The ruggedness, strain-free assembly, and convenience of mechanically-held Kennametal tools enable them to do many jobs that brazed tools cannot do . . . or to do them faster at less cost.

Standard Kennametal tools will handle the majority of these jobs . . . and the basic principles of their design are adaptable to a wide variety of special purpose clamped tools which can be made in your own shop. To assist you we have published a "Clamped Tool Design Manual." Write for a free copy.

Our nearest field engineer can help you use clamped tools most effectively. He represents our organization which pioneered the mechanically-held principle . . . offers you the greatest accumulation of tool-and-time-saving "know-how" available through one source.

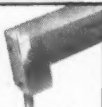


KENNAMETAL Inc., Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES
AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY



STYLE RAR



STYLE TAR



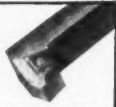
STYLE SFR



STYLE 11SKD



STYLE 11PH



STYLE FRH

GAIN THE

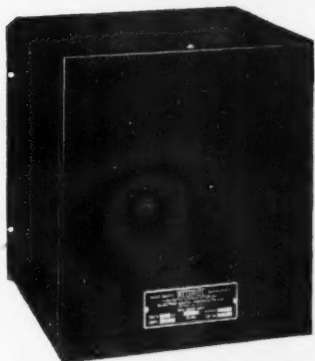
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ELECTRO-MAGNETIC CHUCK CONTROLS

Release and demagnetize work pieces simultaneously. No time lost. No damage to work or to chuck faces. Protect chucks from voltage surges. Speed production.



Manual or Motor Control Models for 50 to 5000 Watts. Chuck area 60 to 7500 Sq. In. Special Models to Suit.



ELECTRO-MATIC RECTIFIERS

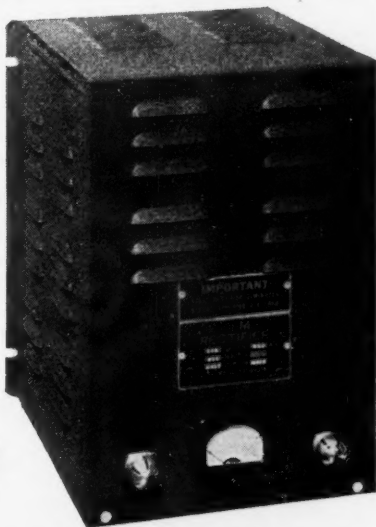
Engineered for dependable power conversion for industrial purposes. Most models equipped with automatic electronic *Time Delay Switch*, adding years to tube life. Quiet and efficient. Fully guaranteed.

Full Particulars Without Obligation

ELECTRO-MATIC PRODUCTS COMPANY

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50 to
20,000
Watts



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Quality
TOOLS



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BUT AN INVESTMENT
that pays year after
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ISSUE
FEATURES

MODERN Machine Shop

NOVEMBER, 1951
Vol. 24, No. 6

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By C. D. Lentz

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Thermal Distortion, Deflection and Vibration in Machine Tools, Part II

By Dr. Max Kronenberg

Dr. Kronenberg concludes his discussion in this article with a consideration of various types of vibrations which are important not only to the manufacturer of a machine tool but to the user as well. Page 122.

Using Statistics in Inspection

By Carl V. Slathar

As chief engineer of the Tractor and Unit Engine Division, Minneapolis-Moline Company, the author of this article relates the important role played by statistical quality control in his own plant. Page 140.

Liberal Use of Gage Blocks Pays Dividends

By H. J. Chamberland

The author suggests several practical methods for extending the useful life of gage blocks which can be applied in practically every type of plant where blocks are used. Page 182.

Silver Brazing Single Handle Mixing Faucets

By Howard E. Jackson

A description of the methods employed in the Ravenna Metal Products Corporation plant, Seattle, Washington. Those who are interested in silver brazing operations will find this article of unusual interest. Page 206.

Broaching

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In this article Mr. Hinman discusses some of the fundamental principles involved in broaching operations. Page 218.

Inexpensive Prototype Tooling

By Frank Charity

A description of a method developed by Mr. O. H. Wismer of Electrical Mechanical Development Company that is designed to enable a manufacturer of a product to determine in advance the practicability of a new product design. Page 230.

Building Diesel-Electric Locomotives



By C. D. LEWIS

Manager, Manufacturing Engineering Dept., Baldwin-Lima-Hamilton Corporation
as told to ROWEN CAMPBELL, Editor

ONE of the most important advancements in the realm of transportation since the invention of the automobile had been the development of the Diesel-electric locomotive. The application of the Diesel engine to railway transportation has provided many important advantages, such as the availability of a compact prime mover at reasonable cost, a dependable form of power transmission, the possibility of adding units as required for a variety of tasks, and sustained performance. Diesels often operate half a million miles between major overhauls.

Of 1755 locomotives on order by Class I railroads as of June of this year, 1733 were Diesel-electric. The Baldwin-Lima-Hamilton Corporation's place in this industry is indicated by the fact that, in a recent six weeks' period, this company received orders for 101 Diesel-electric locomotives having a value of approximately 15 million dollars.

The Baldwin-Lima-Hamilton Corporation's Diesel-electric locomotive plant at Eddystone, Pennsylvania, is well equipped for the task this company has assumed. A few of the more interesting operations in the machining of parts for Baldwin Diesel engines will be presented in this article.

The Baldwin Diesel unit is a straight-in-line engine, of either six or eight cylinders as required. The frame is fabricated of $\frac{3}{8}$, $\frac{1}{2}$, $1\frac{1}{4}$, and 4-inch steel plate, electrically welded. The welding, itself, is a routine operation; the task is to hold the frame in such position that the welder can get at it conveniently. To accomplish this purpose, the welding stand shown in Fig. 1 was built.

The stand is built of steel plate, welded together to form a fixture to which the workpiece can be bolted. To provide easy access for the welder, the fixture is mounted on trunnions, one

of which is enough higher than the other so that the workpiece will be tilted vertically at an angle of 45 degrees, as shown in the illustration. The fixture is counterbalanced to facilitate rotation by hand. A large handwheel made from pipe sections welded together provides the necessary leverage for turning the fixture and workpiece.

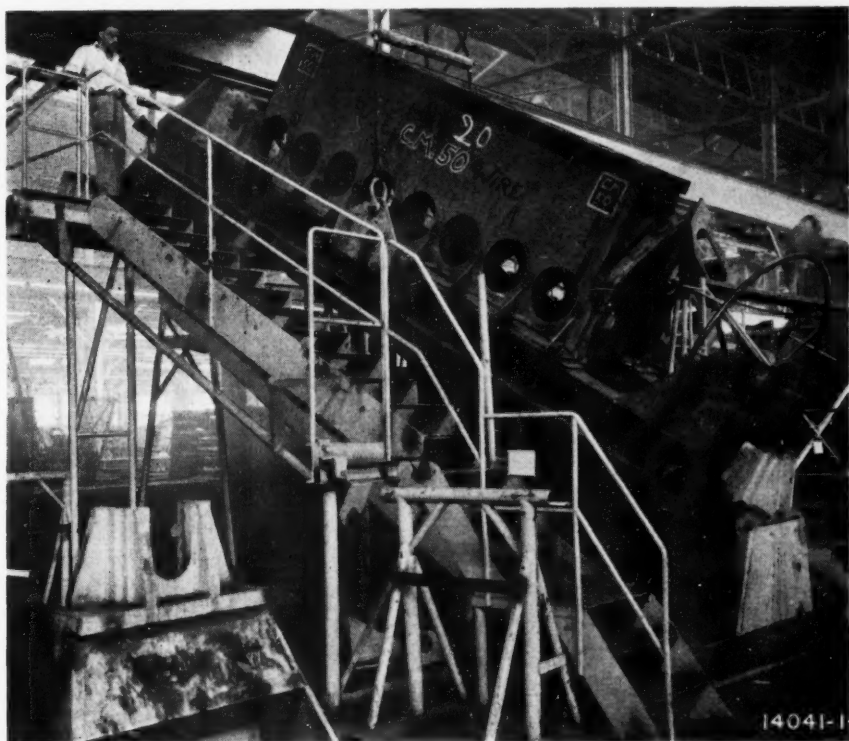
Mounted alongside the fixture is a stair constructed of sheet steel and built at the same angle as the fixture, so that the welder can easily get to any part of the work. This stair is mounted on supports made from sections of pipe, also welded together, and a handrail is

provided as an added safety measure.

The illustration Fig. 2 shows the operation of machining the top, side and bottom surfaces of the engine frame. The machine is an Ingersoll planer-type milling machine, and the cutters, which are 16 inches diameter, are equipped with high speed steel blades.

Operating at a cutting speed of 100 surface feet per minute, two cuts are taken over the three surfaces and a third cut is taken over the top surface. The roughing cuts are taken at a feed of 10 inches per minute, and the finishing cut at 4 inches per minute. A tolerance of ± 0.005 inch is allowed

Fig. 1—Welding stand, built of piping and steel plate, for welding the engine frame.



on the dimension between the sides.

The main bearing holes for the crankshaft are bored in the Diesel engine bed by means of a Giddings & Lewis horizontal milling machine and fixture as shown in Fig. 3. The tools are Davis blocks carrying cutters which are adjusted and ground to conform to the bore diameter. The bearing saddles are bored to a diameter of 10 inches, $+ 0.001$, $- 0.000$, and the surface in each bore is held within 125 micro-inches for finish, the surface being checked with a profilometer. The diameters of the bores are checked for accuracy with the aid of a Sheffield air gage.

Pistons, which are of aluminum, are machined in a line which traverses the four sides of a rectangle, as shown in Fig. 4. In the first operation the pistons are rough turned in a Libby lathe. They move on to a Defiance horizontal boring mill where the wristpin holes are rough-bored. In the next operation the crown is machined on each piston in a Warner & Swasey No. 3 turret

lathe. Here also the pistons are finish-turned and the ring grooves are cut. They then pass on to a Heald Bore-matic, where the wristpin holes are finish-bored. In the last operation, a gang drilling machine is used to drill fourteen $\frac{1}{4}$ -inch oil drain holes in the ring grooves.

From start to finish of the sequence of operations the pistons move on platforms, two pistons to a platform, which ride on the rollers of a conveyor, thus providing for easy handling, speed and precision.

Cylinder sleeves, or "liners," are of cast iron and are bored in the usual manner in a horizontal boring machine which leaves some 0.005 inch to be removed in the finishing operation. In the finishing operation the liners are honed in the Barnes vertical honing machine shown in Fig. 5, a Micromatic micrometer adjustable hone being used for this work. The sleeve is honed to a diameter of 12.757 inch, within a tolerance of 0.0015 inch on the diameter and for roundness and taper. As the operation proceeds to the finishing point, the movement of a lever causes the platform upon which the work and fixture rest to move out from the machine horizontally so that the work can be

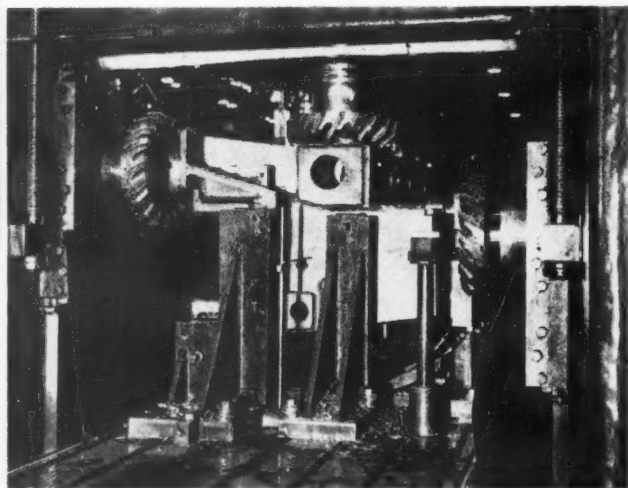


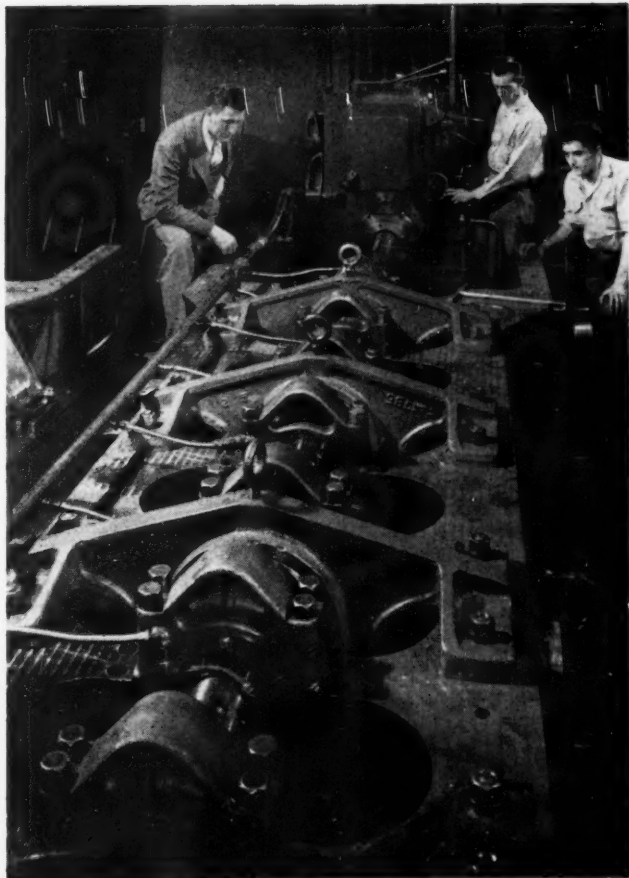
Fig. 2—The top, side and bottom surfaces of the engine frame are machined in this Ingersoll planer-type milling machine.

Fig. 3 — Boring main bearing holes in the Diesel engine bed, using a Giddings & Lewis horizontal milling machine and special fixture. The cutting tools are precision blocks, and the settings are controlled by a micrometer-graduated dial in each block.

gaged. In the illustration the operator is shown using a Federal internal dial gage to check the diameter of the bore.

The operations of turning and grinding the bearings and cams on the camshaft for a Diesel engine are performed in practically the same manner as these operations would be performed for any other type of internal combustion engine. However, the camshaft for the Baldwin Diesel engine has a one-inch hole bored lengthwise through the shaft through which oil can be pumped to the bearings. Oil holes are drilled transversely in each bearing to meet the main hole through the axis.

The operation of boring the one-inch oil hole lengthwise through a shaft while keeping the drill in the exact center or axis of the shaft requires special tooling. In the illustration Fig. 6 this operation is being performed in a



Pratt & Whitney "deep hole" drilling machine, using a special gun drill designed for use with this machine.

The drill, shown in Fig. 7, consists of a long tubular steel shank upon the end of which a high speed steel tip is mounted. An oil tube extending the length of the drill carries oil under high pressure to the cutting lip so that the oil not only lubricates the lip, but also forces chips away from the cutting edge as fast as they form and carries

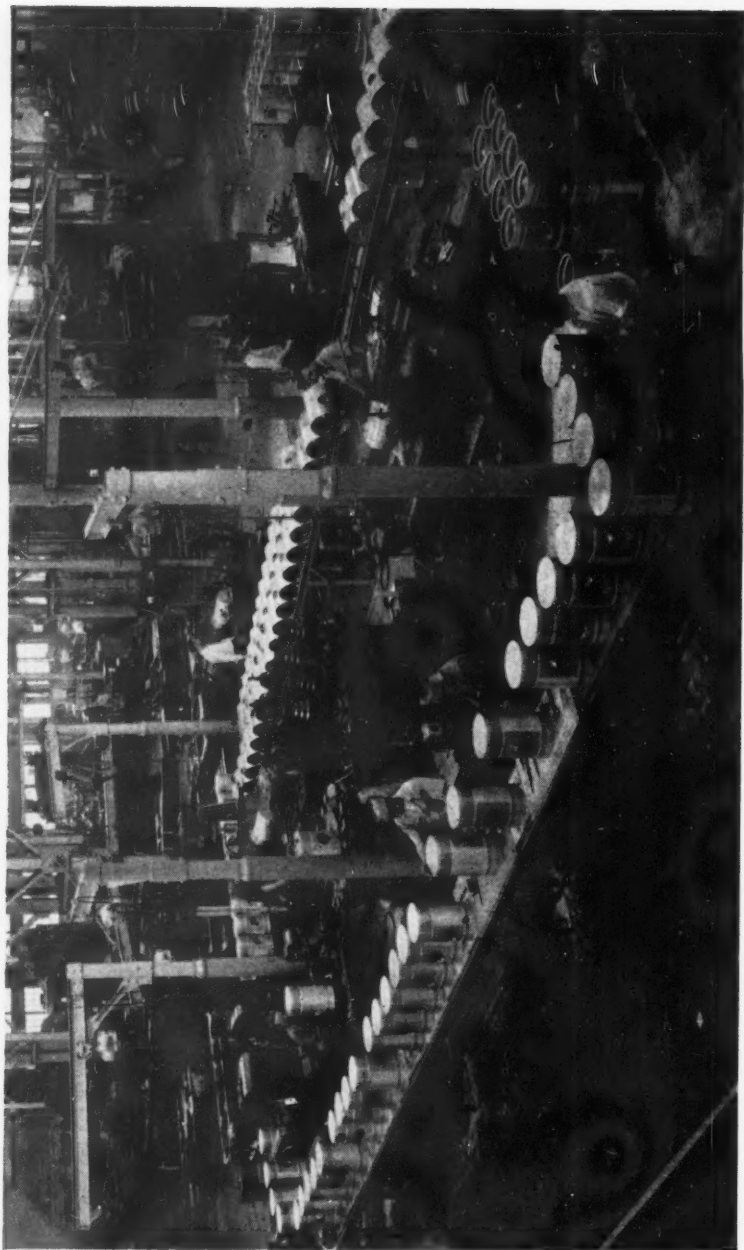
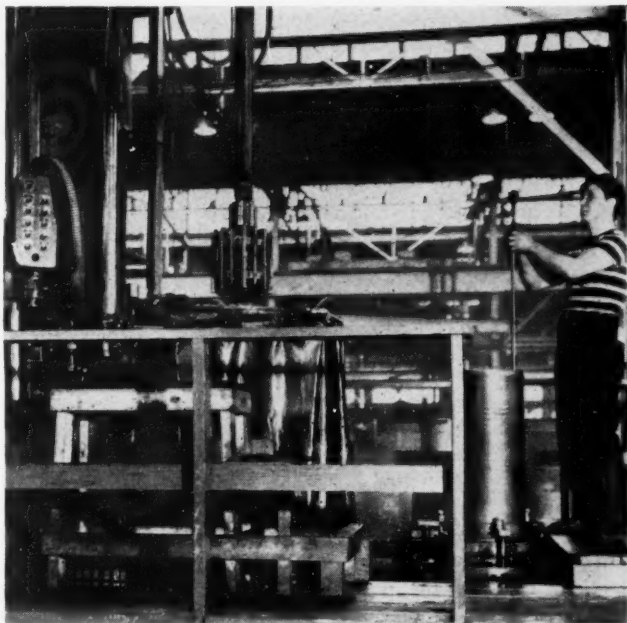


Fig. 4—View of the piston line. The pistons move from one operation to another on a roller conveyor, and the equipment is set up in the form of a rectangle.

Fig. 5—Cylinder liners are honed in this Barnes vertical honing machine. The operator is gaging the bore of a finished liner.



them to the pan through the flute. This quick chip disposal is an important feature in the performance of the drill, making it possible to produce long, true holes.

Accuracy in the drilling operation is maintained by holding the drill stationary while the work revolves. As shown in Fig. 6, the machine is a "twin"; two workpieces are drilled simultaneously. Thus the operator can remove a fin-

ished piece, reload, and start one spindle while the other is in process of being drilled. In the machine shown, holes up to two inches diameter and up to

Fig. 6—A 1-inch oil-hole is drilled lengthwise through the camshaft, for which this deep hole drilling machine and special gun drill was used.

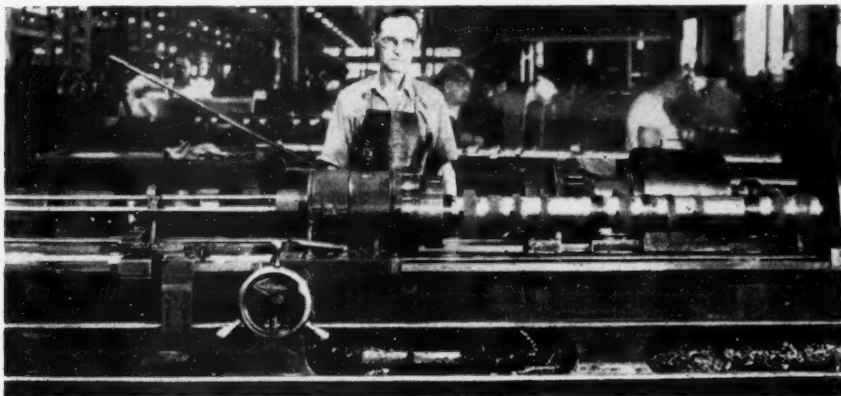




Fig. 7 — The gun drill, shown here, consists of a tubular steel shank with a high speed steel tip. An oil tube extends lengthwise through the drill.

129 inches in length can be drilled.

The cams on the camshaft are turned to size and shape in the American "Pacemaker" lathe shown in operation in Fig. 8. To obtain the exact contour required for each cam, the machine is equipped with a master cam and follower by which the cross slide is controlled. Thus as the master cam revolves against the follower, the cross slide is guided back and forth to dupli-

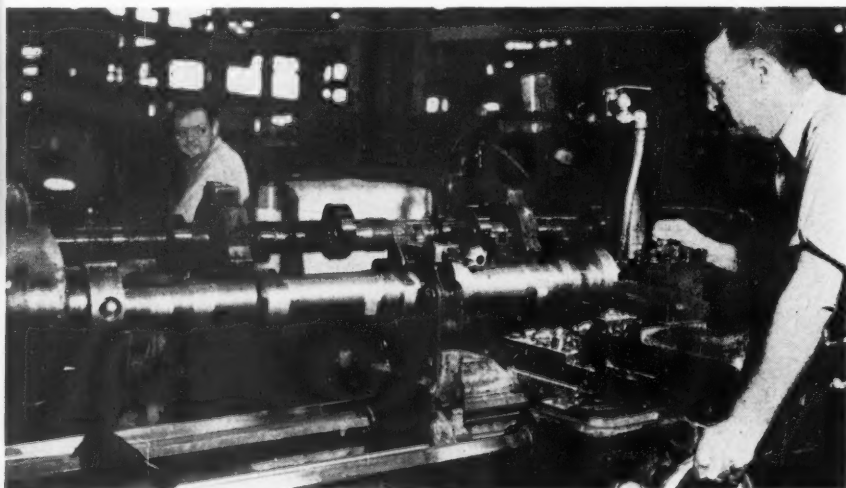
cate the master cam on the workpiece.

Cams are machined in this lathe to limits of 0.015 inch, leaving enough

stock for finishing in the grinding machine. Each shaft carries either three or four fuel pump injection cams, three or four inlet cams, and three or four exhaust cams.

Connecting rod journals on the crankshaft are turned and the cheeks are faced in the Wickes lathe shown in operation in Fig. 9. In this machine the shaft is anchored in a stationary position and the cutter is held in a cir-

Fig. 8—Camshaft cams are turned to size and shape in this American lathe, the exact contour being obtained by the use of a master cam and follower which controls the action of the tool.

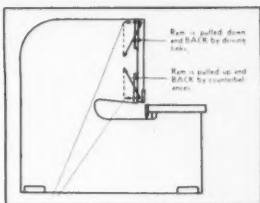


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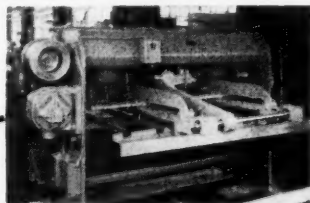
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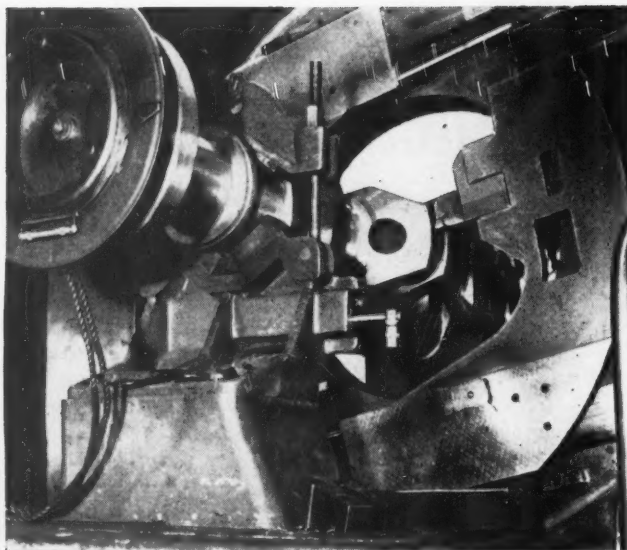


Fig. 9 — Connecting rod journals and cheeks on the crankshaft are machined in this special crankshaft lathe. The shaft is held stationary while the cutter revolves.

a carbide tool is used for facing. On the turning operation the tool revolves at a speed of 35 r.p.m., using a feed of 0.032 inch per revolution. The speed is cut to 25 r.p.m. for the cheek-facing operation.

cular diaphragm which revolves around the workpiece. The advantage of this method consists in that it is much easier to revolve a tool around each one of the eight journals in turn than it is to revolve the huge crankshaft in the conventional type of lathe. Adjustment is provided for the diaphragm so that it can be set to the required distance off center within the limits of the machine.

A high speed steel toolbit is used for the turning operation and

The pins are finished to a diameter of 8.907 inches, leaving from 0.050 to 0.060 inch of stock to be removed in the finish grinding operation.

Crankshafts are ground in a Landis crankshaft grinding machine which reduces the pin diameters to 8.836 — 8.837 inches. The machine, with the crank-

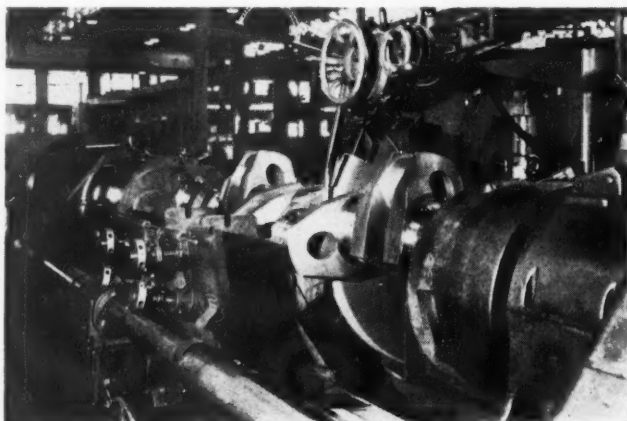
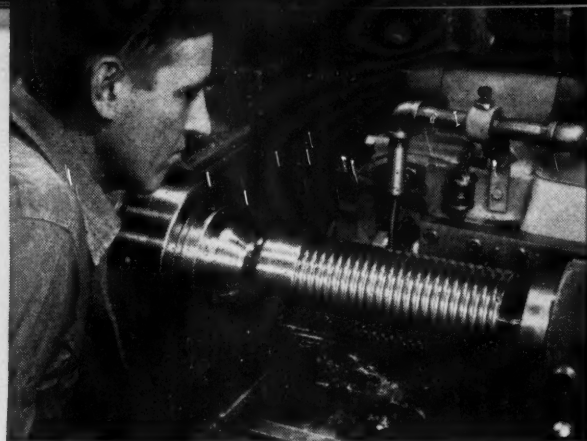
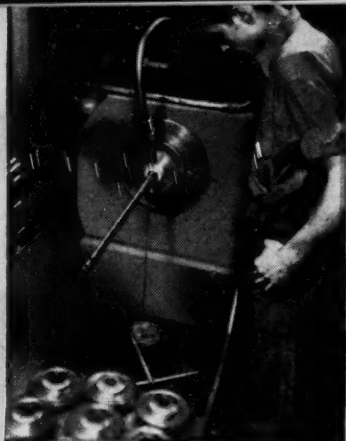


Fig. 10 — Crankshaft bearings and pins are ground to finish size in this Landis crankshaft grinding machine.



THREAD MILLING A SCREW.

Metal: SAE 2345 steel heat-treated to 28 Rockwell • Machine: Lees Bradner thread miller • Part: 5 1/4" adjusting screw for press brake • Operations: rough and finish thread milling • Tool: high-speed steel • Feed: 0.260 depth on roughing • Cutting Oil: Sunicut 105



BROACHING A GEAR KEY-WAY.

Metal: SAE 2345 steel forging 220 Brinnell • Machine: 3L8 La Pointe hydraulic broach Part: gears for shaper, produced two at a time • Tool: 3' high-speed steel broach • Cutting Oil: Sunicut 105

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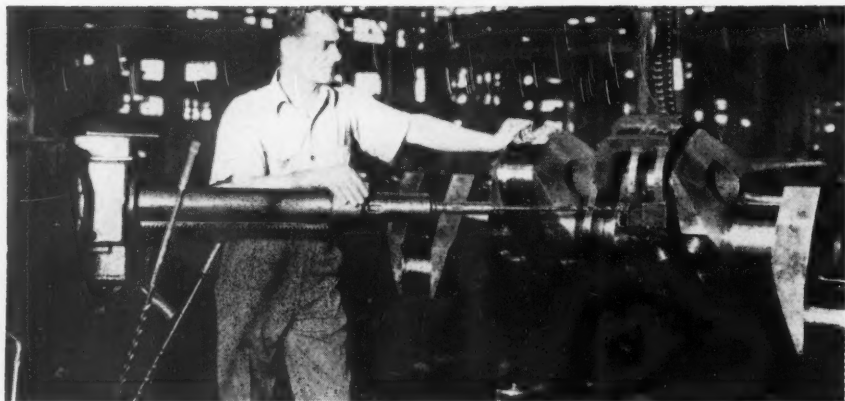


Fig. 11—A one-half inch oil hole is drilled at a 45-degree angle in each crankshaft "pin" to provide for lubrication of the connecting rod bearing and wristpin, also for piston cooling.

shaft in position for grinding, is shown in Fig. 10.

In each pin on the crankshaft a one-half inch hole is drilled at a 45-degree

angle to provide for the lubrication of the connecting rod bearing. To drill this hole, the crankshaft is lifted by the overhead crane and mounted in a

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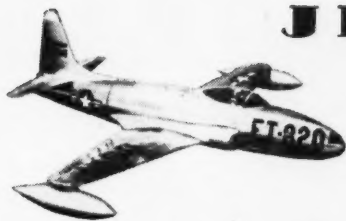


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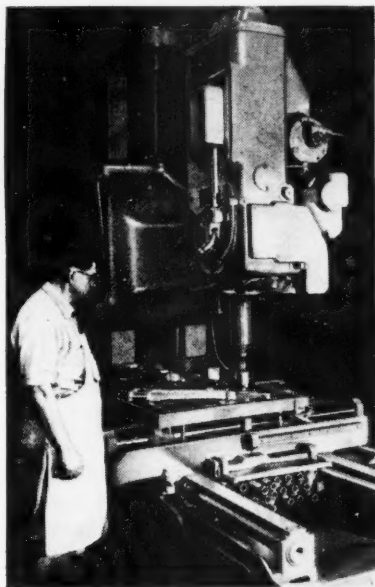
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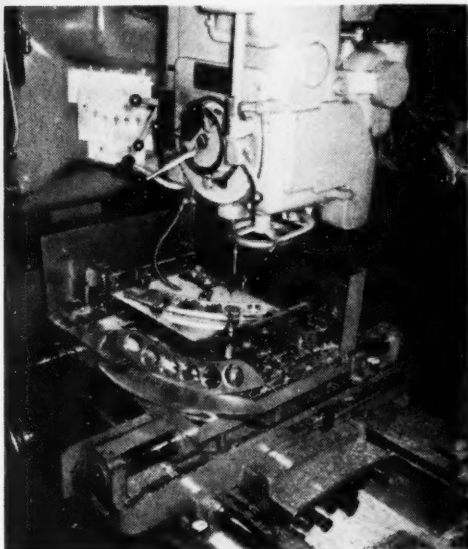
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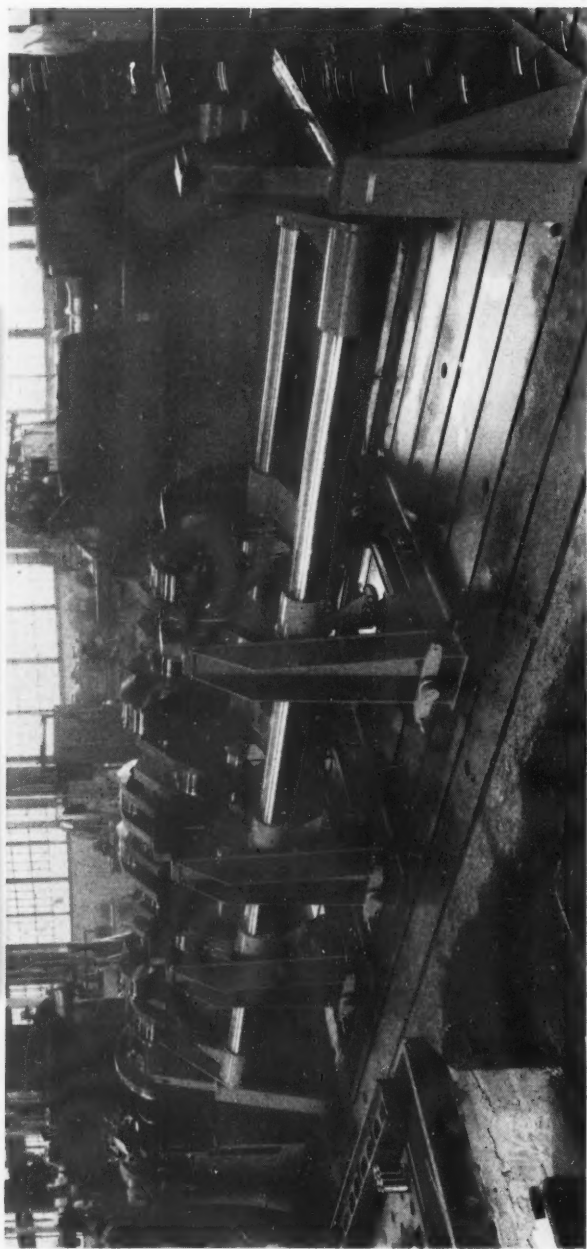
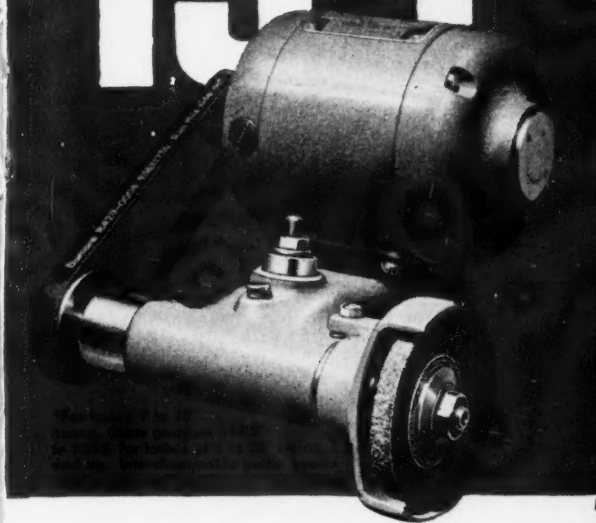


Fig. 12—When finished, the crankshaft is tested for balance in this Gisholt Dynetric balancing machine and the balance is corrected to an infinitesimal tolerance.

cradle in such position that the hole can be drilled horizontally by means of a horizontal drilling machine, as shown in Fig. 11. The machine rides on a track parallel to the cradle so that it can be moved backward or forward as required to drill the pins.

Before assembling to the engine, each finished crankshaft is balanced statically and dynamically in the Gisholt Dynetric balancing machine illustrated in Fig. 12. In this machine the crankshaft is revolved at a speed of 125 r.p.m. while an indicator, in contact with each of the main bearings, records the vibration on the dials of the instrument. After the locations and amounts of unbalance have been determined, the unbalance is corrected by drilling out or adding the

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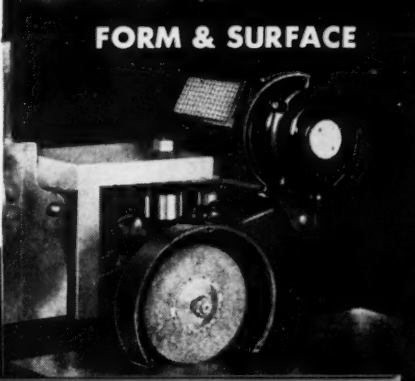




Fig. 14 — Using a Barnes horizontal gun drilling machine, a one-half inch hole is drilled lengthwise through the web of the connecting rod.

required amount of metal to the nearest cheek. The shaft is then rebalanced to make sure that it is in perfect balance before it is released to the assembly department. The precision available through the use of this machine is such that the shaft, weighing 4,790 pounds, is balanced to $1\frac{1}{2}$ inch-pounds. With parts built to such precision, it is easy to understand why a Diesel engine will operate for half a million miles between major overhauls.

An interesting operation — that of induction brazing of the lubricating oil connections to the lube oil header — is

shown in Fig. 13. The lube oil header supplies lubricating oil to the main crankshaft bearings. The lube oil header consists of a length of two-inch brass pipe, and the connection bosses are made from $1\frac{1}{2}$ -inch diameter brass bar stock. The joining of the connection boss to the header is done by brazing with silver solder, the heat necessary for brazing being derived from a high-frequency current developed through the use of a Lepel induction heating unit. The current is transmitted through a load coil which is preformed to encircle the connection after it has been placed in

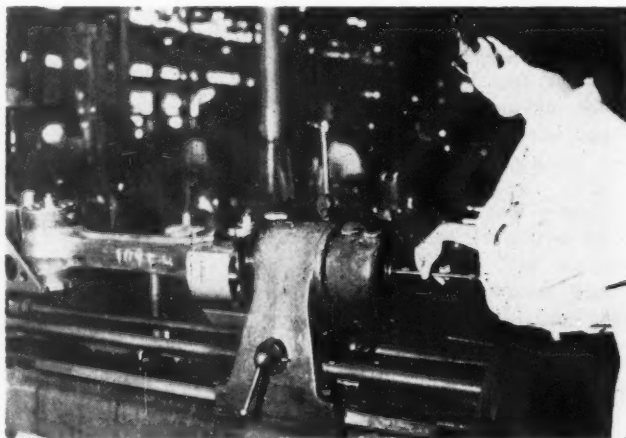
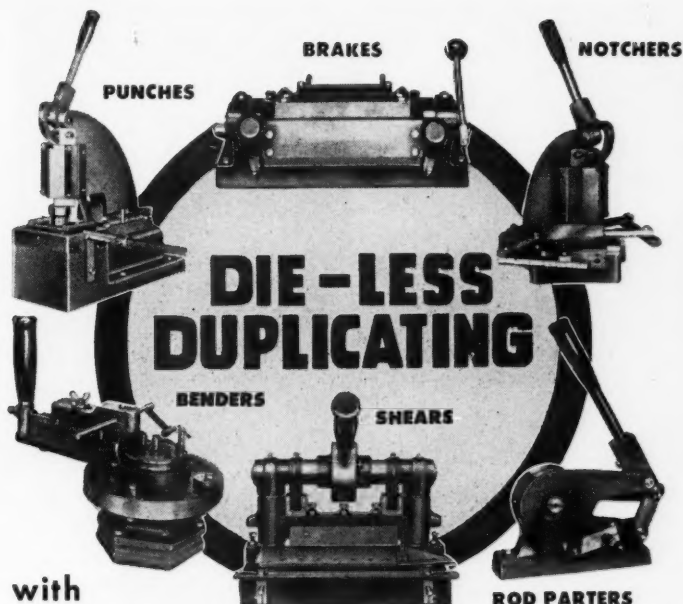


Fig. 13 — Lubricating oil pipe connections are brazed to the oil header by the induction heating method, current for which is supplied by a Lepel induction heating unit. The operation is completed in 20 seconds.



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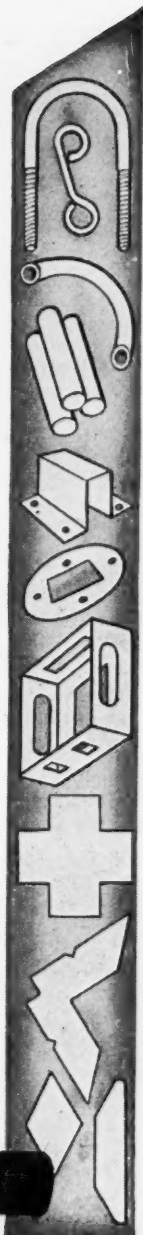




Fig. 15—Using a Franklin tube expander with a Dudley electronic control to expand a copper tube in the cylinder head to seal off the water passage.

position on the header. The current is controlled by means of a manually-operated foot pedal, and the total time for the operation is 20 seconds. The machine shuts off automatically at the end of the cycle.

To provide lubrication for the connecting rod wristpin bearing and piston cooling, a one-half inch hole is drilled lengthwise through the web of the rod, as shown in Fig. 14. This is another "gun drilling" operation, the machine being a Barnes horizontal gun

drill especially designed for this type of operation. A Pratt & Whitney drill is used, smaller but of the same type as that described earlier in this article and shown in Fig. 7. In this operation the connecting rod is revolved at a speed of 490 r.p.m. and the drill is fed at a rate of $\frac{3}{8}$ inch per minute.

The tool shown in use in Fig. 15 is a commercial tool designed for a special purpose, but the operation is of sufficient interest so that it was thought worthwhile to include a description of



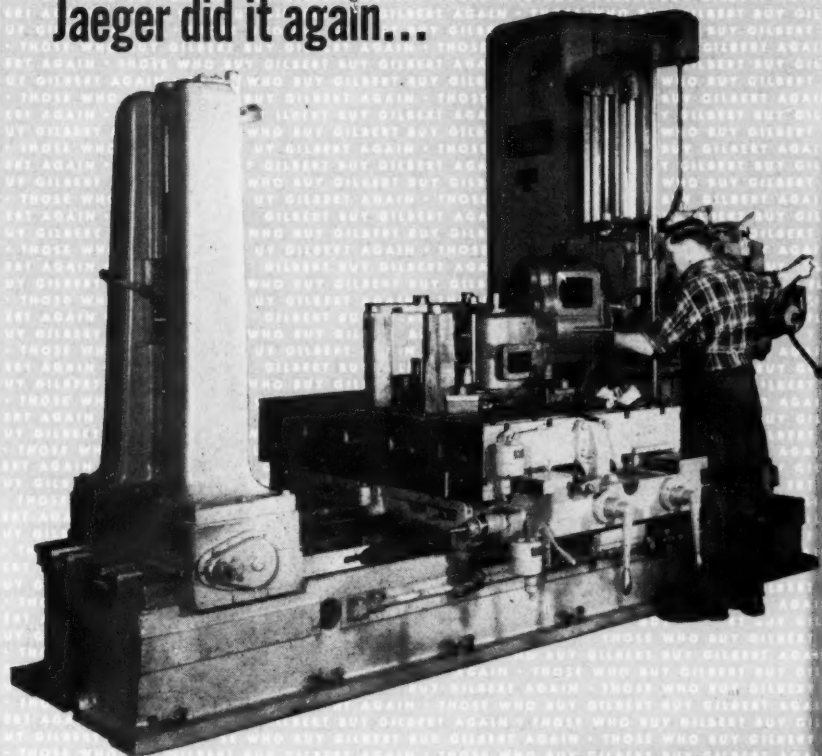
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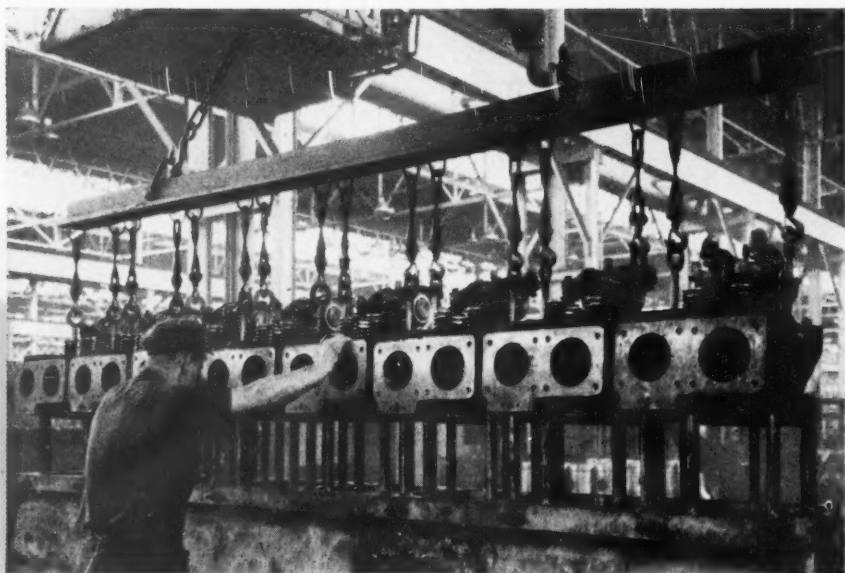


Fig. 16—Assembling cylinder heads to the engine frame. This carrier has made possible the savings of many hours on each job.

it in this article.

In this illustration the operator is shown anchoring a copper injection tube in a cylinder head to seal off the water passage in the head. To expand the copper tube properly, an electronically-operated tube expander is used which, revolving in the spindle of an electric motor, expands the tube against the wall of the cylindrical hole.

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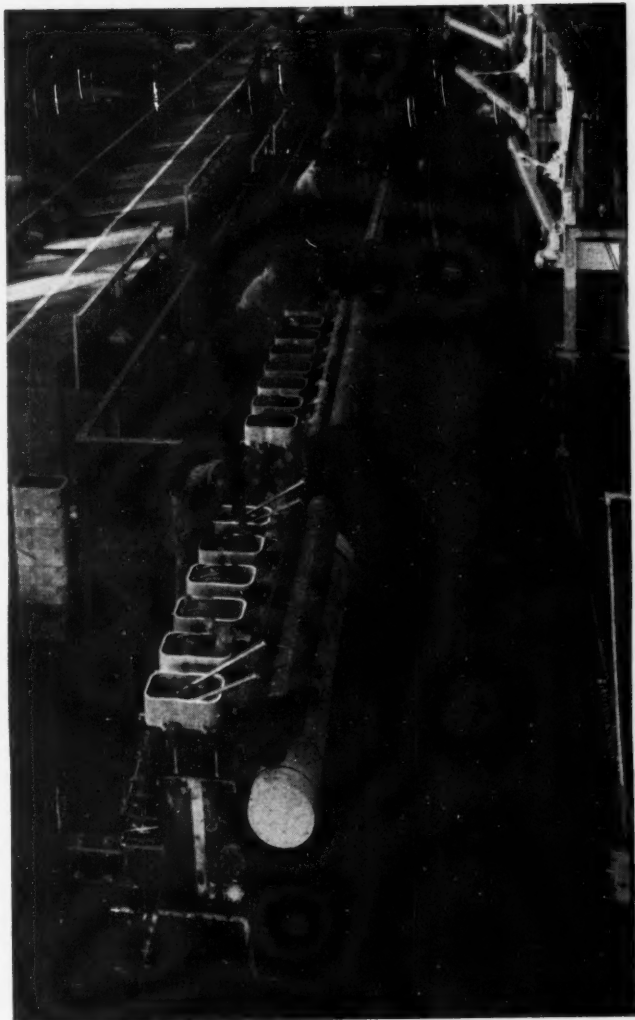
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Fig. 17—Baldwin Diesel locomotive engines on the final assembly line.

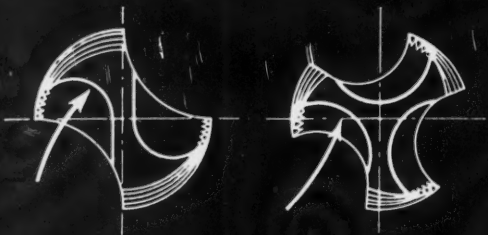
pansion throughout the tube.

In Fig. 16 a mechanic is shown in process of applying the cylinder head assembly to the engine frame. This task is performed in a minimum of time by suspending all eight of the heads from a carrier which is lifted and moved to position over the engine frame by the overhead crane. The hooks from which the heads are suspended are attached to turnbuckles, threaded onto a stud in such manner that they can be adjusted, if necessary, to bring all of the heads to the same height to facilitate assembly. Each hook has a snap closure to prevent any of the heads from dropping out of the rings in process of assembly. Once the studs by which the heads are lifted have been threaded into the bolt holes in the heads, the entire operation of assembling the heads to the frame can be done in less than it has taken to describe it.



The final assembly line is shown in Fig. 17. Here the accessories and instruments are attached to the engine frame after the major assemblies have been completed. Each engine frame assembly rides on its own car on a narrow-gauge track.

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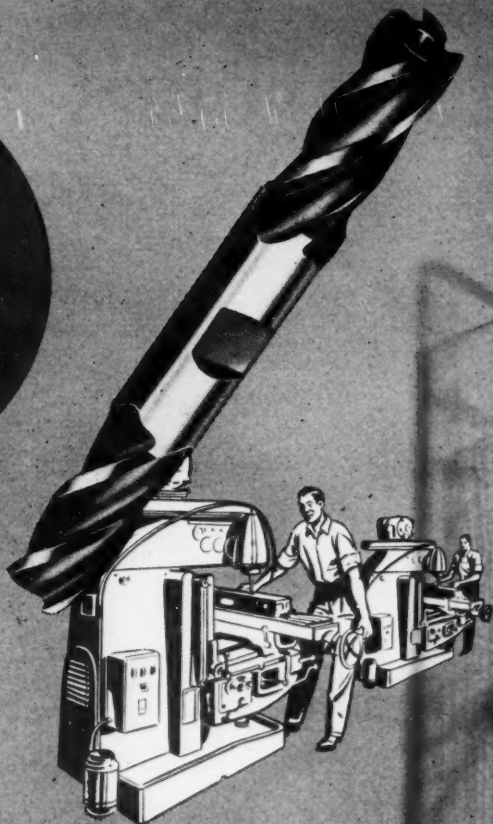
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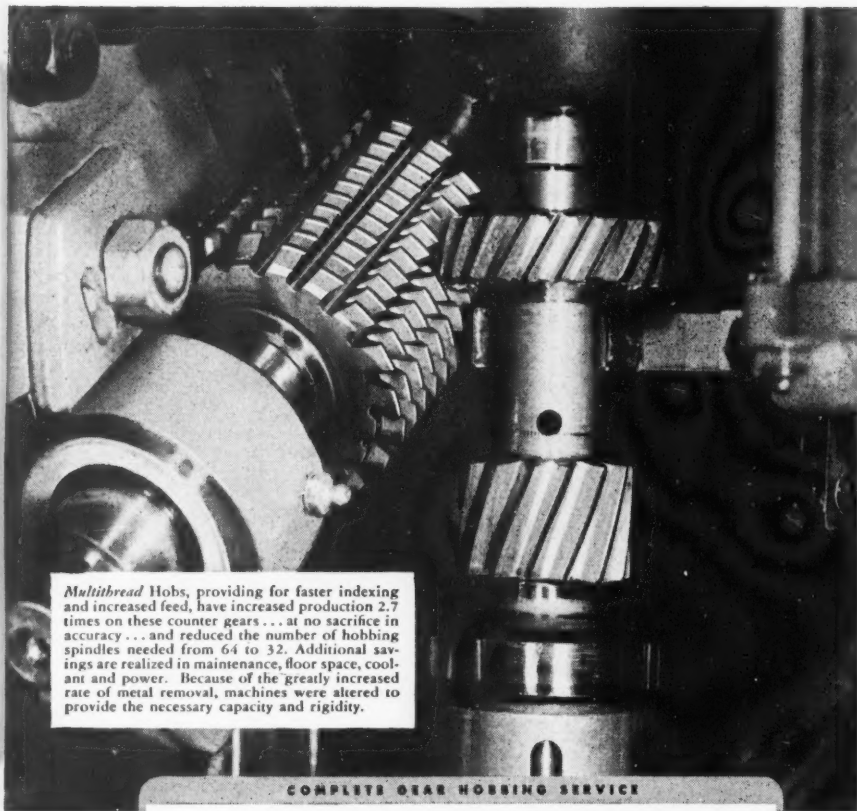


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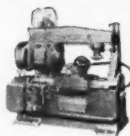
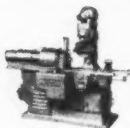
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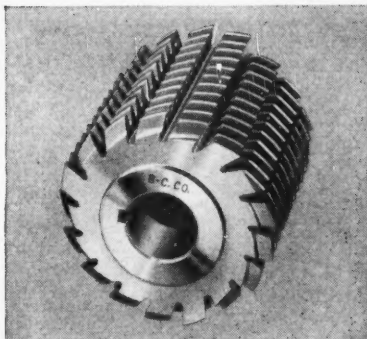


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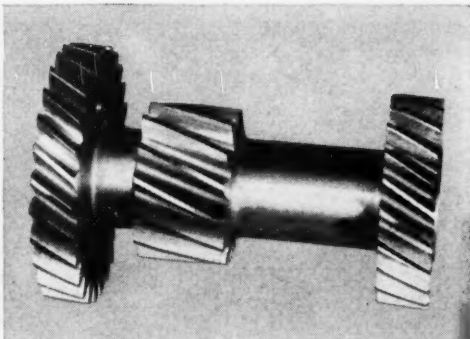
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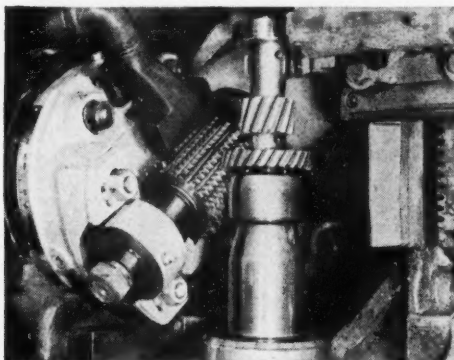


▲ These 27 and 22-tooth 9.25 pitch gears (for passenger car and truck transmissions) are forged from AISI 5145 or 8620-H steel. *Multithread* hobs have cut costs per gear to slightly over 1/3 former average. Lead errors are held within .0005". Production per hour has been increased from 26 to 82 gears (net, at 85% efficiency).

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▼ The 27-tooth gear on the counter gear is hobbled at 156 rpm and .062" feed. Previous feed was .053". Face width is 5.8". Cutting time per gear has been reduced from 6.55 to 2.2 minutes. Remarkable savings are possible because of increased feed and faster indexing with *Multithreads*.

The 22-tooth gear on the counter gear is hobbled at 156 rpm and .052" feed. Cutting time is 2.16 minutes. Single-thread ground hobs formerly cut at .043" feed. Hobbing time averaged 6.13 minutes per gear.



Multithread Hobs are a development by Barber-Colman engineers, providing faster indexing in the hobbing of gears. Instead of the usual single lead, *Multithreads* have several threads, and have produced unusual production increases on gear cutting jobs requiring very high rates of output.

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Cutting Tools

Thermal Distortion, Deflection And Vibration In Machine Tools, Part II

From a paper delivered by the author before the Rockford Chapter
of the American Society of Tool Engineers.

By DR. MAX KRONENBERG

VIBRATION is often encountered in metal cutting operations which may sometimes become very violent. In shop language the term "chatter" is often used for vibrations leaving "chatter marks" on the workpiece or those which produce noise. In many cases, however, as indicated before—vibration is hardly perceptible, but is nevertheless often the cause for poor tool life, damage to machine parts, low production due to down time, poor surface finish, and so on. In addition, these vibrations affect the strength of the foundations causing early deterioration due to fatigue and shock, particularly when the machines are used on upper floors.

Scientific literature on vibration in machine tools is almost non existent. Although the principles of vibration are the same as in other fields of engineering, such as aircraft engines or automobiles, vibrations encountered in machine tools are often self-excited as compared with those encountered in

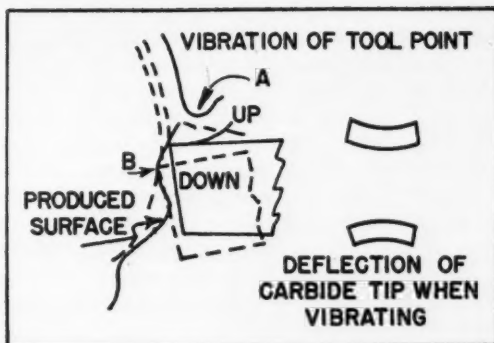
other lines of engineering, namely forced vibrations.

Before proceeding to a discussion of the differences between self-excited and forced vibrations, it is necessary to indicate here also, that the directions in which vibrations occur require consideration. It is necessary to differentiate between lateral vibration—such as the vibration of a string in a violin—and torsional vibration, which is the periodic twisting of a shaft about its axis of rotation.

Lateral Vibrations

Lateral vibrations in machine tools can be caused by a great number of reasons, such as unbalance in rotating parts (which is among the more simple cases of vibration), faulty bearings, excessive overhang of the tool, jerky movements of tables in reciprocating machines, and so on. While jerky motion is often due to stick-slip friction between moving parts, the design of

Fig. 7—Sketch illustrating the case of a self excited vibration of a cutting tool and of generating chatter marks on the work.



beds, knees, overarms, gear boxes, headstocks, tailstocks, machine columns, tables, and so on, may also be a cause for vibration. We are still accustomed to consider the housings merely as covers for power transmitting elements, although they have to withstand forces, and are subjected to stress variations which may account for vibration.

Inaccuracies in the engagements of gears, wind-up in the shafts may also be responsible for vibrations. A shaft having a key way on one side may vibrate due to periodic changes in the deflection, as the shaft rotates.

Amplitudes and Frequencies

It is not yet possible to say definitely what amplitude of vibration is permissible. Frequencies are usually more important than amplitudes due to the fact that the stresses set up in the tools or machines are linearly proportional to the amplitude but increase with the square of the frequency. Hence, as far as fatigue of machine parts or cracking of carbide tips is concerned, frequency consideration should have preference over amplitude considerations.

Study of Vibration

Experience has shown that the most rapid and least costly method of dealing with detrimental vibrations is to study their nature and not to attempt expensive changes in the design before an analysis has been made. Such study should start with observation and

measuring vibration and include also a mathematical analysis of changes and their possible results.

Self-Excited Vibrations

Self-excited vibrations occur very often in machining operations, although forced vibrations, which are mostly encountered in aircraft engines, also play a significant role in tool engineering. The difference between these types of vibration will become more evident by referring to some examples. The "humming" of the telegraph wires is due to the wind, whereby the air is flowing around the wire. Wind is usually not an oscillating force, but rather a steady force which can produce vibration. The frequency of vibration depends in such cases only on the dimensions and physical properties of the wire which vibrates at its natural frequency.

Similar conditions exist in many metal cutting operations. In the case of turning, the workpiece may be taken as the wire (or a violin string) while the tool may be compared with the bow, provided that we have dry friction.

Forced Vibrations

Forced vibrations, which are also encountered in metal cutting operations,

result from the periodic change of a machines; they may come into resonance of the material and the separation of the chip. The formation and removal of the built-up edge may likewise cause forced vibrations, and so may the chatter marks on a workpiece produced in a preceding turn of the workpiece.

Another source of forced vibrations may be found in the mechanism of the machines, they may come into resonance with the cutting force and in this way cause heavy chatter.

Combined Vibrations

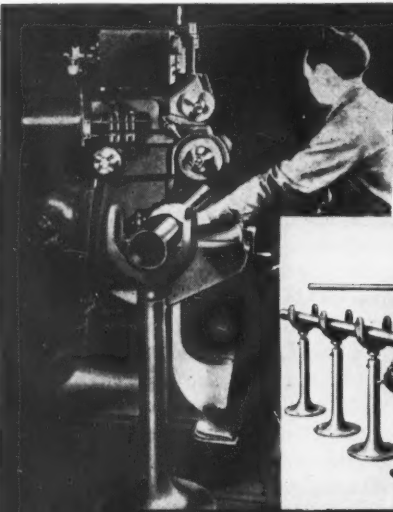
In actual practice we find very often that both self-excited vibrations and forced vibrations exist simultaneously. A lathe tool, as an example, may be subjected to the forced vibration resulting from chip formation and to the self-excited vibration resulting from friction between tool flank and work-

piece. Friction between chip and tool face may likewise generate self-excited vibration. This condition resembles the case of an eraser point pushed over a surface. When the eraser is compressed by a force acting in the direction of motion (of the eraser) until the restoring force of the rubber overcomes this compression, the eraser will jump and thus vibrate. A chip may do the same when gliding over the tool face.

In my opinion we don't know for sure whether chip formation is the consequence or the cause of vibration. That's the same story as that of the chicken and the egg. Which one was first?

Analysis of Self Excited Vibration

Fig. 7 has been prepared to illustrate the case of a self-excited vibration of a cutting tool and of generating chatter marks on the work. The full lines indicate the neutral position of the tool.



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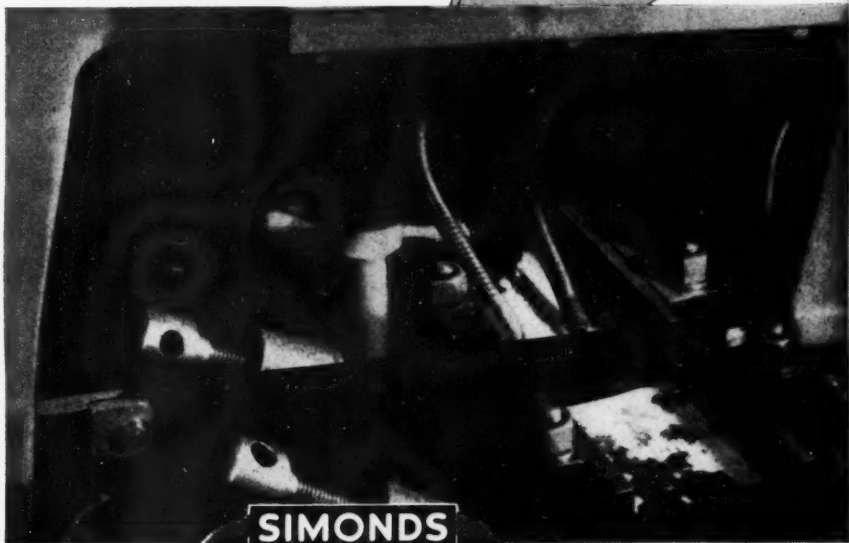
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The dotted lines at "A" show the tool bent upward, while it is bent down in the case of position "B". The wavy path represents the chatter mark produced on the workpiece.

When the tool is in midposition while moving downwards, it is taken along by the work. Hence the friction force between them must be great, otherwise the tool would not go along. The speed difference between work and tool must

be small. When the tool is again in midposition, but moving upward, the friction force will be less than before but still substantial, while the speed difference will be larger than before. Hence in both directions, in the midway position, the friction force is high and energy is fed into the system which will therefore vibrate more and more. This is a criterion of a self-excited vibration.

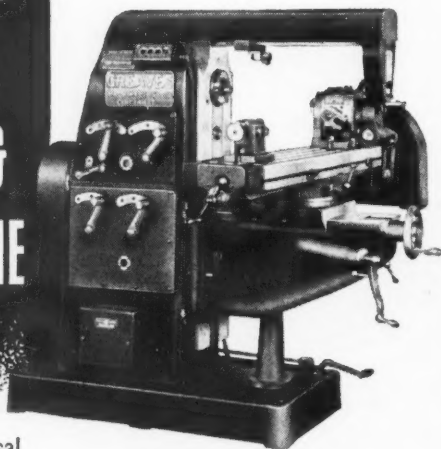
Self-excited vibrations are more

easily generated when the (cutting) force drops as the speed increases. Since, with sintered carbide tools, such a drop in cutting force is found for speeds about one hundred to three hundred feet per minute, it is my conclusion, that poor tool life of carbides at low speeds is the consequence of self-excited vibration occurring more frequently at low speeds (due to the drop in cutting force) than at high speeds.

Vibration in Machines as Excited by Forces

In the example of a milling machine, the threshold of vibration is definitely related to the mag-

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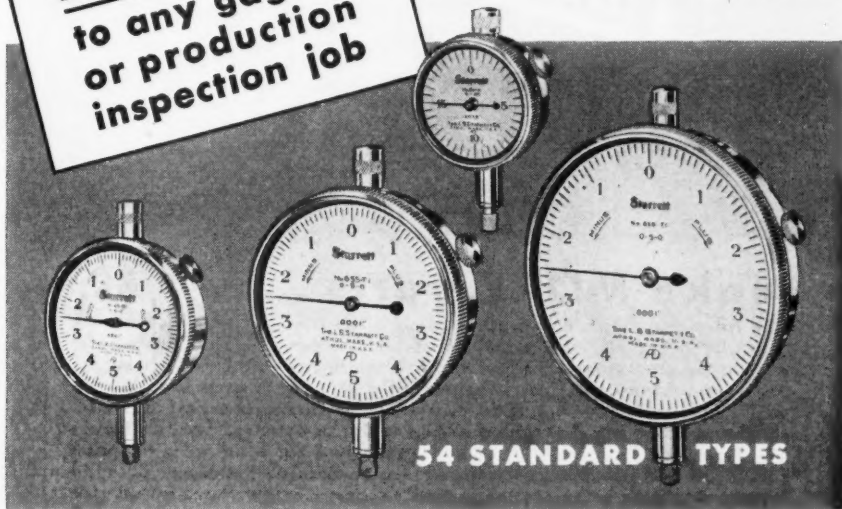
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Fig. 8—Sketch of gear train.

nitude of the vertical cutting force component, that is, to the component which either pushes the work down on the table or is lifting it up from the table. If this force is zero or very small,

instability exists and vibration can be generated. For a given machine and set up, the relationship for the threshold of vibration can be expressed by a formula taking into account the feed rate f_m , the depth of cut (d), and a constant for the machine. This formula is: $f_m/d^3 = \text{constant} (= .0045 \dots)$

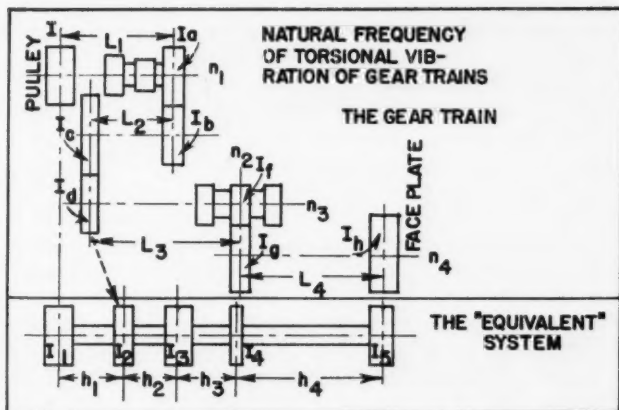
This formula reveals that the permissible feed rate for freedom from vibration is inversely proportional to the cube of the depth of cut. Hence a slight reduction in depth of cut permits a large increase in feed rate without running into vibration. Taking two equal cuts instead of one, permits eight times the feed rate. The amount of metal removed per minute is therefore four

times as great. It is therefore advisable to "sweep" over the work, wherever possible, with large feeds and small depths of cut, in order to obtain high production without chatter.

Vibration Caused by Machine Parts

Although it is much more common practice to look for unbalanced motors, faulty bearings, poor gear engagement, and so on, as causes for vibration than to consider chip formation and friction which we discussed so far, it may be useful to review vibrations caused by faulty machine parts.

Cases in which vibration originates in parts remote from the cutting edge may affect tool life and surface finish when



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the conditions are such as to favor resonance with the self excited vibration or forced vibration at the cutting edge.

Vibrations in gears are due to eccentricity, errors in machining, unbalance, shaft deflections, high points and even dirt. A number of formulas exist from which the frequencies of vibration can be calculated.

Vibration due to belts and chains can likewise be determined from formulas.

One of the main causes of belt vibration is the splice and the stretched part may act like a violin string causing vibrations.

Ball bearings vibrations are more complex, as already indicated previously in connection with temperature rise and lubrication. We find, however, that depressions in the outer or inner race or high points striking each ball periodically, and irregularities in the balls may also cause vibrations.

Torsional Vibration in Gear Trains

So far we have limited our discussion to lateral vibrations and thereby disregarded the fact that a lathe tool has a certain distance from the center of the rotating work-piece. Likewise, the blade of a face milling cutter has a certain distance from the center of rotation. Hence, a work-piece or a cutter will not only vibrate laterally but also torsionally.

Torsional vibrations are transmitted to the gear trains and may come into resonance with the chip formation caus-

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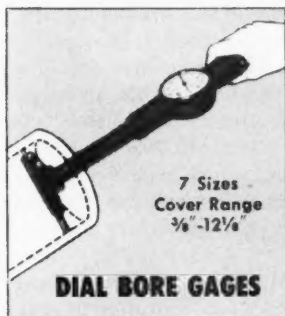
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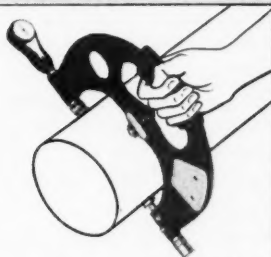
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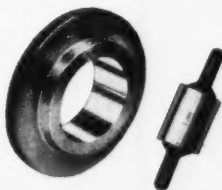


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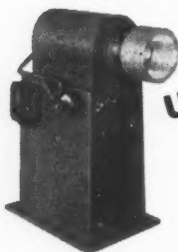


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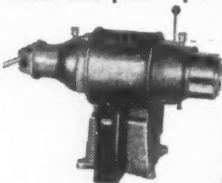


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ing heavy chatter. They are rather complex to analyze, particularly in machine tools where many more fundamental frequencies occur than in an aircraft engine. In a machine tool the inertia of the masses changes when the speed setting is changed because different gears come into engagement and different shafts transmit power. In an aircraft engine the masses are not changed when the speed is changed.

Gear failures in machine tools are often due to vibratory fatigue, although nobody would suspect existence of vibration in many cases. Just as in the case of the tiny atom, where tremendous forces are hidden, we may say that small vibrations may have very destructive effects.

For the calculation of the natural frequency of torsional vibration of gear trains in machine tools, various steps are necessary among which the following are the most important:

- Sketch the gear train, showing the engaging gears for the r.p.m. setting to be analyzed
- Replace gears by inertia masses (according to the formula $I = w/1400 (D^4 - d^4)$)
- Unite engaging gear masses into equivalent masses:

$$I_{eq} = I_{driver} \frac{n^2_{driv}}{n_{ref}^2} + I_{follower} \frac{n^2_{foll}}{n_{ref}^2}$$

- Determine the equivalent shaft length

$$h = \frac{I_{pref} L}{I_{p shaft}} + \frac{n^2_{shaft}}{n^2_{ref}}$$

I_p = polar moment of inertia of shaft

- Sketch equivalent oscillatory system (as shown in Fig. 8). The natural frequency can be calculated now by the Holzer method or an approximate method which I had the privilege to develop.

It is not always necessary to compute the natural frequency for all spindle

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settings, but often sufficient to calculate it for about 4 settings and to interpolate graphically. In most cases it will be found that the natural frequency of torsional vibration decreases as the spindle speed is increased.

Tool Life and Vibration

Tool life of sintered carbide tools is very greatly affected by vibration. This is not so much the case with high speed

steel tools. The reason for the difference is twofold in my opinion.

First, it is the generation of fatigue cracks and second the rapid wear of the tip subjected to forced vibration impulses.

Carbide tips are made of a mixture of powdered tungsten, carbon and small amounts of other metals and are therefore very sensitive to tension and changes from tension to compression and back to tension.

That is exactly what is happening when the tool is vibrating, as was shown in Fig. 7 where the upper surface of the tip is under compression when the tool is in the upper position (A), and under tension when the tool is in the lower position of vibration (B).

Such variation causes failure due to fatigue. How soon such failure may occur will depend on the magnitude and number of stress reversals. If a metal can endure, say 8,000,000 stress cycles without failure, it will continue its resistance to this stress indefinitely. On the other hand, failure will occur soon when the stress in the tip is slightly be-



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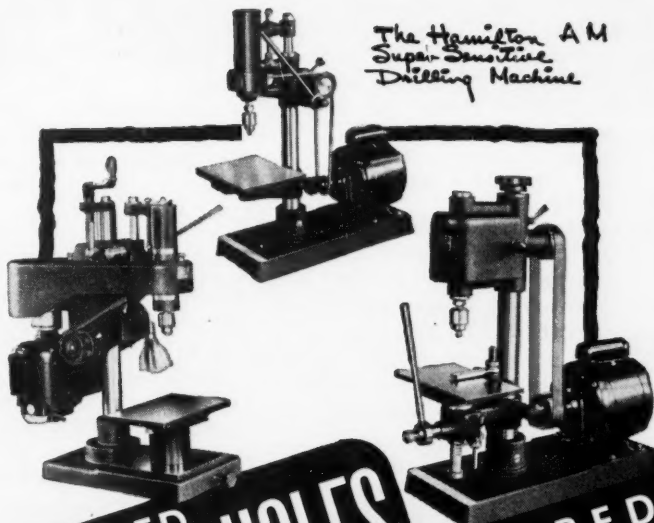
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yond the endurance limit for fatigue.

Assuming, as an example, a frequency of vibration of 400 cycles per second, then 8,000,000 cycles will be reached, and cracks may appear, after

$$\frac{8,000,000}{400 \times 60 \times 60} = 5\frac{1}{2} \text{ hours}$$

Fatigue cracks may occur after one hour when the frequency is higher. This should, however, not be taken as meaning that the machines should be designed for low natural frequencies. In general, it is better in my opinion to build light machines with high natural frequencies rather than heavy machines with low natural frequencies.

With heavy machines at low natural frequencies it may happen that the higher modes of vibration may still enter the resonance field, while when building for high natural frequencies, the higher modes will be even more re-

mote from resonance.

It is known that vibrations have a greater effect on tool life than high speeds, particularly in milling operations. Impact failure of face milling cutters having a greater angle of engagement than 30 deg. may likewise be due to vibration.

Additional Ways to Avoid Vibration

Some other ways to eliminate vibration may briefly be indicated. They are:

- 1) Change the masses of the rotating gears so as to obtain a node at the cutter.
- 2) Use flywheels close to the cutter.
- 3) Introduce hydraulic or other types of couplings to change the natural frequency of the design.
- 4) Incorporate dampers or vibration absorbers, such as has been done with overarms for milling machines.

Conclusion

Our knowledge of machine tool vibration is still incomplete and further research is required. We may be able to simplify the design and build better machines when we can improve tool life and surface finish by designing a vibration-proof machine. Vibration still remains a frontier for the tool engineer.



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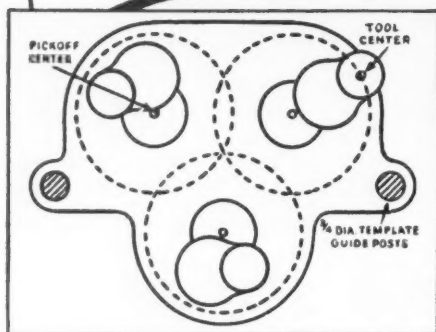
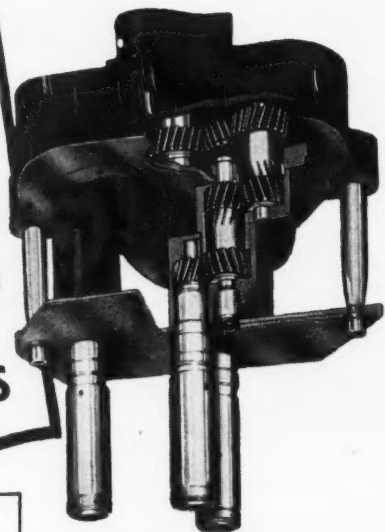
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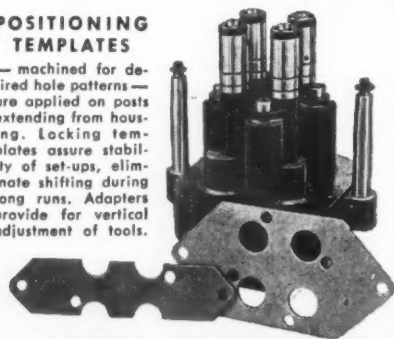


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Using Statistics In Inspection

By CARL V. SLATHAR

Chief Inspector, Tractor and Unit Engine Division,
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THE use of statistics in inspection, generally known as Statistical Quality Control, when discussed in relation to its mathematics and probabilities, is often confusing to shop people. We will attempt to present information in this article in such a way that only a little knowledge of statistics will be necessary to realize the importance and value of statistics to the Inspection Departments. The Inspection Department which is a service to the various other departments must have factual data for statistics in their files. These facts

can be statistically analyzed and used to assist departments such as the Engineering, Service, Sales, Purchasing, Methods, Tool Design, Shop Foremen, Machine Maintenance, and Foundry, and will be helpful in taking inventory. The following illustrations will demonstrate the various techniques.

Inspection can be set up with various risk factors. It is now generally understood by manufacturers that a perfect product is impossible and that at some point between **no** defects and **all** defects, is the sensible and economical line

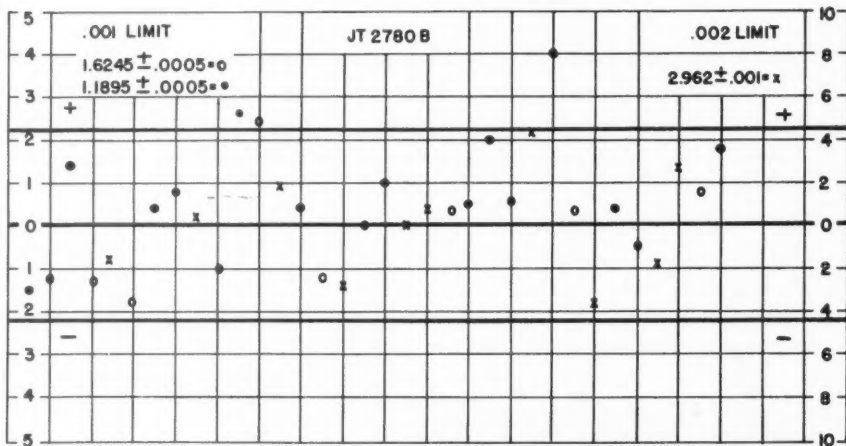
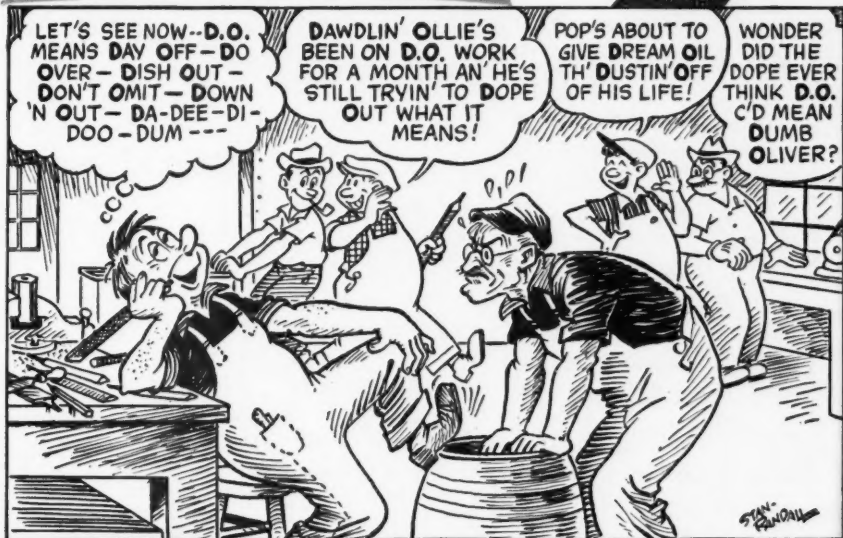


Fig. 1—The results of selecting and checking random samples from parts in process or from machines at irregular times are plotted on a chart as shown here.



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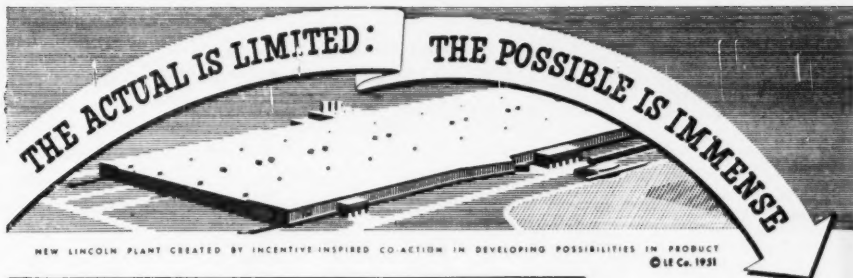
WORK SHEET													
Pattern No. JT 2780 B				Part Name Front Axle				B. P. Limits 1.6245 \pm .0005					
Operation No. 70				Describe Operation Grind O. D.									
Dept. No. 104				Machine No. 24				Order No. 1782				Code = 0	
No.	Date	Time	Insp.	Opr.	SAMPLE SIZE					\bar{x}	R	INSPECTOR'S REMARKS	
					1	2	3	4	5				
1	3-26	12 ²⁵	W. H.	Mann	-3	+2	-1	0	-4	-1.2		.004 Run out. Notify Foreman.	
2	"	3 ⁰⁰	"	"	-2	-2	-1	+1	-3	-1.4			
3	3-27	3 ²⁰	Van	Andy	-1	-2	-2	-3	-1	-1.8			
4	"	12 ⁰⁰	W. H.	Mann	-1	-1	-2	0	-1	-1.0			
5	3-28	11 ⁴⁰	T. H.	Holmes	+3	+1	+1	+4	+2	+2.2			
6	"	3 ³⁰	Van	Andy	0	-1	-1	-2	-2	-1.2			
7	3-29	9 ⁵⁰	T. H.	Holmes	+1	0	-4	+2	+1	0			
8	"	9 ³⁵	Van	Andy	0	0	+1	+1	0	+4			
9	"	12 ⁴⁰	W. H.	Mann	+1	+1	0	+1	0	+6			
10	4-4	9 ⁵⁰	T. H.	O. H.	-2	+1	+3	0	0	+4			
11	"	3 ²⁰	Van	Andy	-1	+2	-1	-3	+1	-4			
12	4-5	10 ⁰⁰	T. H.	O. H.	+1	+2	0	0	+1	+8			
13													
<div style="display: flex; justify-content: space-between;"> <div> \bar{x} U.C.L. = L.C.L. = </div> <div> \bar{x} U.C.L. = L.C.L. = </div> <div> Total Averages </div> <div> \bar{x} R </div> </div>													
<div style="display: flex; justify-content: space-between;"> <div> U.C.L. = L.C.L. = </div> <div> N No. out of Control \bar{x} R </div> </div>													

Fig. 2—The results of selecting and checking random samples from parts in process or from machines at irregular times may be noted on a work sheet of the type shown here.

at which you must produce. Statistical control can be based upon any percentage defective and an appropriate probability may be selected. In our case, the probability of approximately 99 per cent under normal conditions and small random samples was selected. The statistician recognizes these probabilities as belonging to six standard deviations of the normal distribution. All statistics quoted in this article are based on the above. Therefore, when a defect is plotted above the chart limits, 99 per cent of the time we are correct in saying the

defect did not occur because of natural reasons and can be attributed to machine trouble, carelessness, tool breakage, and so on.

The system of inspection selected and the statistical techniques used depend on type of manufacture, the size of budget, company policy and nature of the personnel. In this article, the conditions were such that small random samples are the most effective and economical. We place emphasis upon randomness for without randomness any statistical quality control system will fail. Ran-



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Fig. 3. Saves 51% Cost by forming lever arm and pad as integral piece from 10 gauge metal. Weighs 2.5 pounds... costs 34¢.

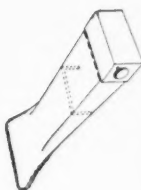


Fig. 4. Saves 67% Eliminates Broaching. Hub with integral key is produced by stacking stampings in assembly. Arm is 10 gauge, brake formed and welded to hub. Cost is only 31¢... weight 2.2 pounds.



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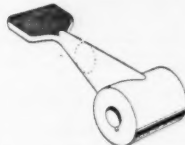


Fig. 1. Traditional Construction. Machine foot-lever, 10 inches long, weighs 6 pounds. Cost with broached keyway is \$1.15.

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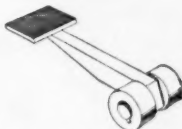


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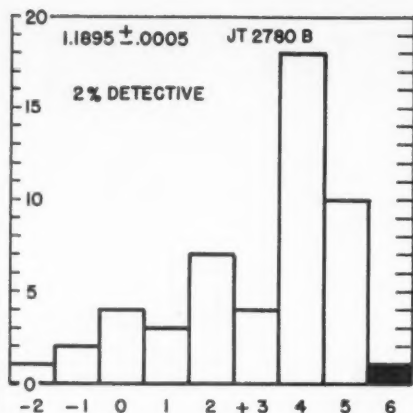


Fig. 3—This Histogram covers a random sample of fifty pieces which were taken from a questionable batch of material.

domness does not happen automatically. Inspection supervisors recognize this as a major problem. For instance, if a large load of fairly heavy material is

in a hot warehouse, the inspector taking a sample of 50 pieces would rather take all pieces from the top of the load. This surely is not random, but a few pieces from the top, bottom, side, corners and middle of the load would provide a representative random sample.

An outline of duties and charting methods assembled in a manual furnished to the inspectors and their supervisors is of tremendous help in problems of supervision. With this outline, the inspector's work automatically becomes scheduled and limited in authority. The inspector patrols his department, selecting random samples from parts in process or from machines at irregular times. He inspects these parts at a modernly equipped inspection station, centrally located within the patrolled area. Important dimensions and defects are plotted on a graph as shown in Fig. 1 or noted on a Work

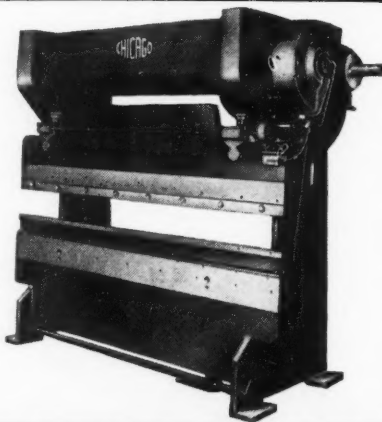


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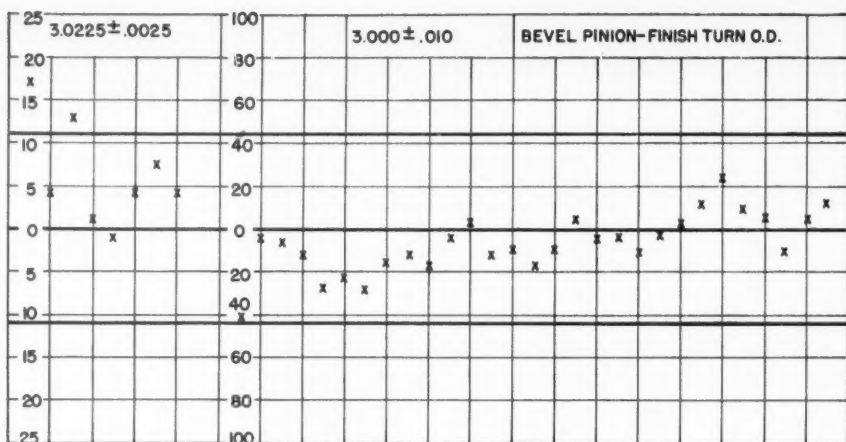


Fig. 4—On this control chart, each X represents the average of a sample of five pieces, and the control limits are placed statistically.

Sheet as shown in Fig. 2. When a serious defect is discovered, the shop foreman is notified immediately by verbal or written notice. The alliances, conflicts, and unnecessary conversation of the old type inspection are lessened through this procedure.

When a first sample of five is checked, the foreman has a better picture of sound or unsound job set-up practice. Formerly, both the operators and foremen considered staying within close tolerances quite an art, often highly seasoned with luck.

Increased accuracy of inspection and

machine process set-ups are noticeable when the dimensions of five pieces are registered on a work sheet, as shown in Fig. 2, where the inspector, operator, time, and so on, are registered. Charts and work sheets, Figs. 1 and 2, when completed are kept on file as data from which any future statistics may be drawn.

The control chart Fig. 1 is designed to accommodate more than one dimension by the use of symbols. The statistical limits of averages are drawn in red lines. First, second, and third shifts are plotted on the chart and work sheet in

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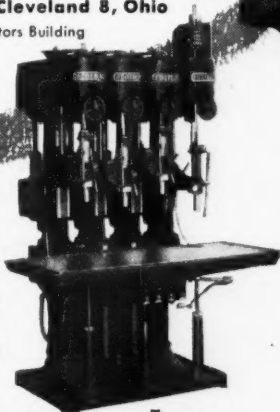
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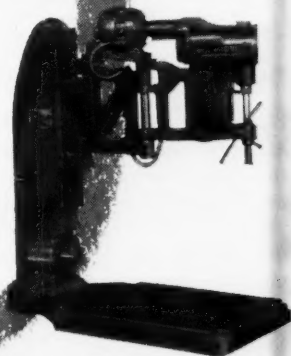
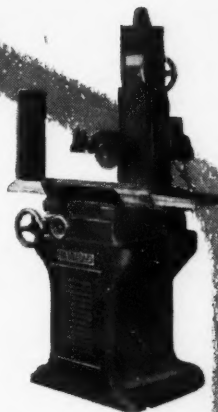
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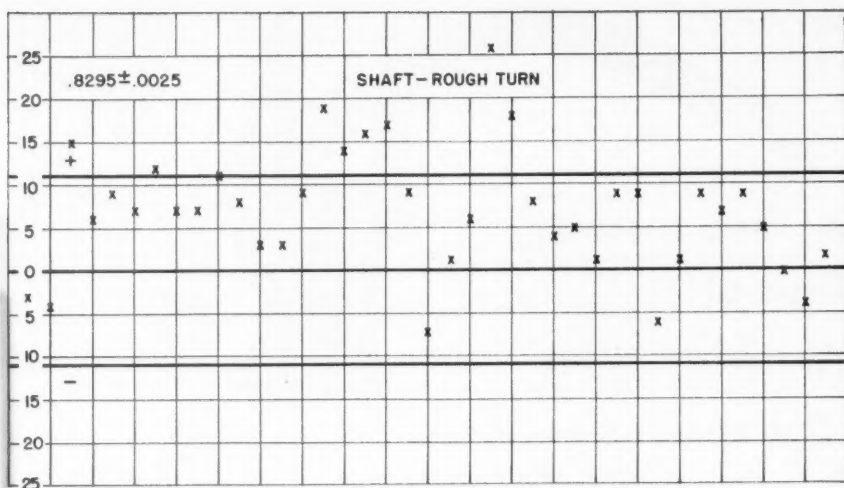


Fig. 5—This is a control of averages recording the rough turn size for grinding the O.D. of a shaft.

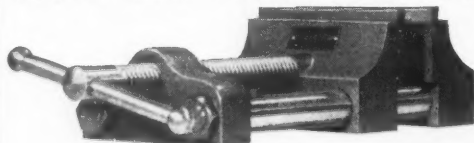
black, red and blue respectively to indicate at a glance the shift producing the out-of-tolerance work. These charts, which are posted with the blueprint at the machine or work station, may be seen by the shop foreman and machine operator as well as inspectors and the inspection supervisors.

When a dimension is charted which is out of control or tolerance limits, the inspection supervisor having been trained in the basic elements of Quality Control recognizes the probability of off-standard material present in that

specific batch. A Histogram, Fig. 3, which covers a random sample of fifty (50) pieces, is taken from the questionable batch of material. The seriousness and percentage of defects discovered by this exploration will indicate the need for either releasing or sorting this production, plus corrective action by the shop foreman.

Disrespect for tolerance is enemy No. 1 on inspection department's list. On Fig. 4, we found disrespect for the tolerance on the O.D. of a gear blank. (On this control chart, each "X" represents

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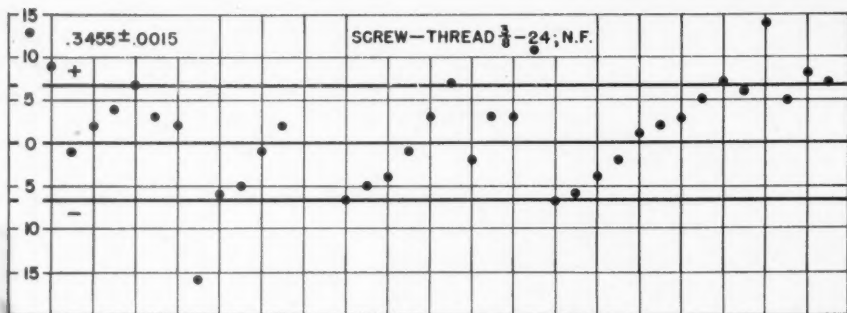


Fig. 6—The control chart of averages shown here indicates a definite trend from the low limit to out-of-control on the high side.

the average of a sample of 5, and the control limits are placed statistically.) The response to inquiry on the out-of-tolerance work was that the limit was too tight and unnecessary. Inspection then tried to get a practical and respected tolerance. Notice the tolerance change from .005 to .020 and the values between the horizontal lines are changed. This limit is still sound from the standpoint of engineering principles and the change in tolerance allows more time between tool adjustments. Note the heavy concentration around the median line.

Statistics Promote Better Relations Between Shop Departments

Fig. 5 is a control chart of averages recording the rough turn size for grind-

ing the O.D. of a shaft. The high and low limit lines are placed statistically from shop tolerance specifications. Each check mark indicates the average of a five piece sample. The chart shows stock being allowed out-of-tolerance in a plus direction or on the high side. In analyzing the chart, it was discovered that stock was allowed in a plus direction to insure cleanup at the finish grind dimension. The .005 tolerance was respected only on the minus side, but as in most cases, there were other operations to consider. The shop foreman in charge of grinding complained. His problem was to keep the grinder wheels from crush dressing on a rough and irregular turned face. The grinder operator was removing more stock than called for on the original timestudy. Con-

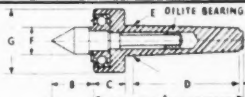
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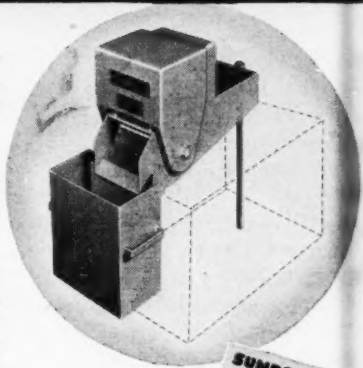
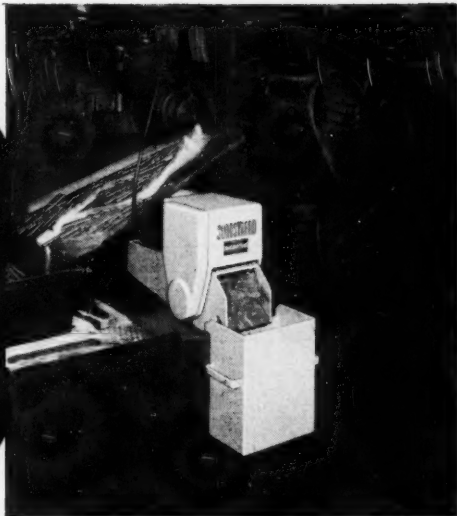
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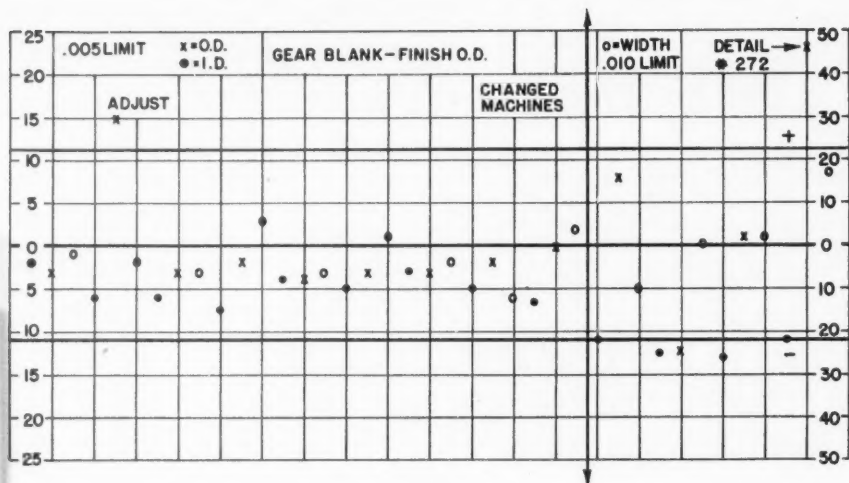


Fig. 7—A dual purpose control chart of averages illustrating an example where the machining of a gear blank was changed from one machine to another machine of the same type.

sequently, the grinder operator would remove this stock in the allotted time at the sacrifice of quality on the finished dimension. After proper action had been taken by the inspector and the shop foreman, the condition was improved as you will notice at the end of the chart. The turn limits are now respected. Quality of the finish operation is improved and relations between the Production Departments are harmonious.

Fig. 6, another control chart of ave-

rages, indicates a definite trend from the low limit to out-of-control on the high side. In this case, the defective pitch diameter of a stud was causing considerable scrap, sorting and rework.

Through the joint action of the inspectors and supervisors based on statistical record, it was found that an adjustment of die chasers was necessary each 20 minutes instead of the previous once per hour. An adjustment each 20 minutes proved impractical from cost standpoint. Ultimately, heat treated



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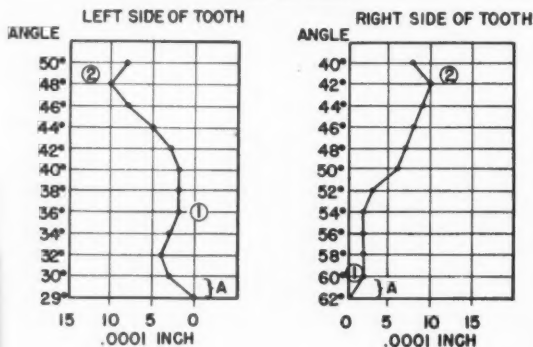


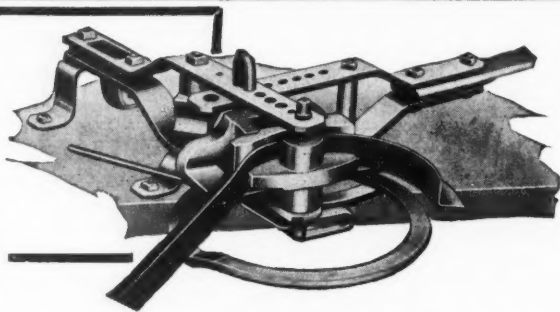
Fig. 8 — The curves shown on these charts are the plotting of readings taken from an involute checking machine.

stud stock and improved chaser design gave the desired results.

Fig. 7, another dual purpose control chart of averages, is an example of where the machining of a gear blank was changed from one machine to another machine of the same size, make,

foreman and production control expediter can re-schedule machine operations to machines with suitable capabilities. Shop maintenance supervisors can profit by a periodical review of this chart which may well be called a machine capability audit.

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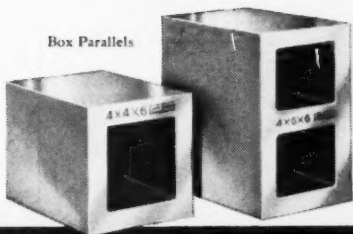
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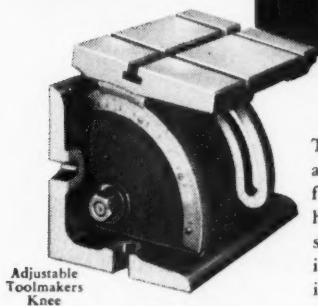


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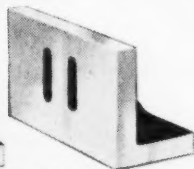
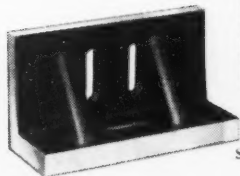


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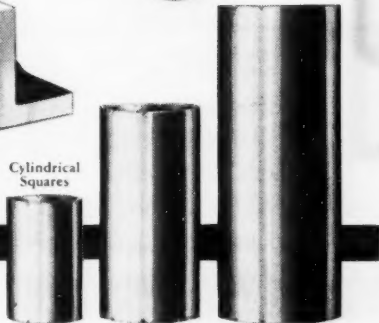
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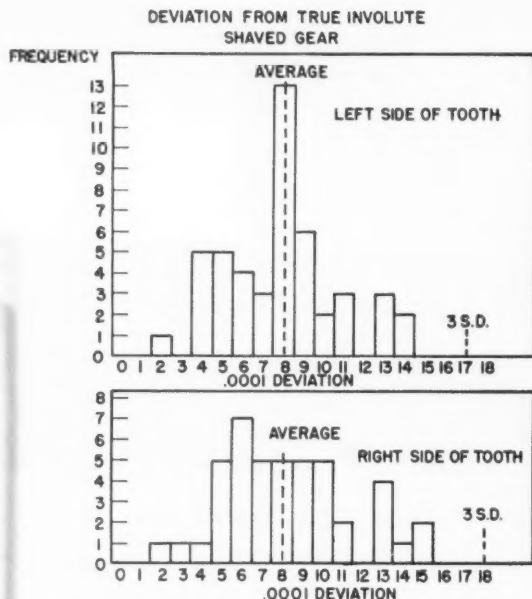


Fig. 9—The three standard deviation limits shown here can be applied to total variation of involute deviations from point "1" to point "2" on the curve construction shown in Fig. 8.

Record Involute Graphically

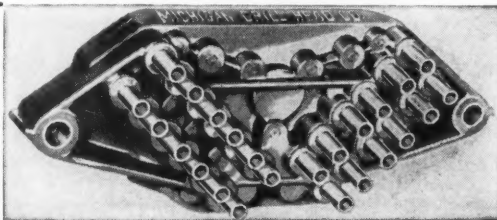
Statistics becomes a valuable tool in setting and maintaining quality standards on the elements of gear manufacture. A mass of charts and other accumulated data on involute, lead error, and so on is of little value until arranged in a frequency distribution and analyzed statistically. The curves constructed on chart Fig. 8 are the plotting of readings taken from an involute

checking machine, on a 21 tooth spur gear with modified stub tooth, 5/7 pitch, long addendum. The material is fine grain, cold finished steel SAE 8620 which is carburized and heat treated after machining to a minimum of 58 Rockwell C. The maximum pitch line circumferential speed is 630 ft. per minute when under load. The vertical scale represents degrees rotation of the gear and the horizontal scale the deviations, in .0001 inch from the perfect tooth form or true involute. The deviation is recorded every 2° as read on a dial indicator which is set to read zero at the base radius. The section of the curve marked "A" in Fig. 8 illustrates the undercut at the base of the teeth which is a relief for the shaving cutter. The significant part of the curve starts at the line which indicates the last point of contact with the mating

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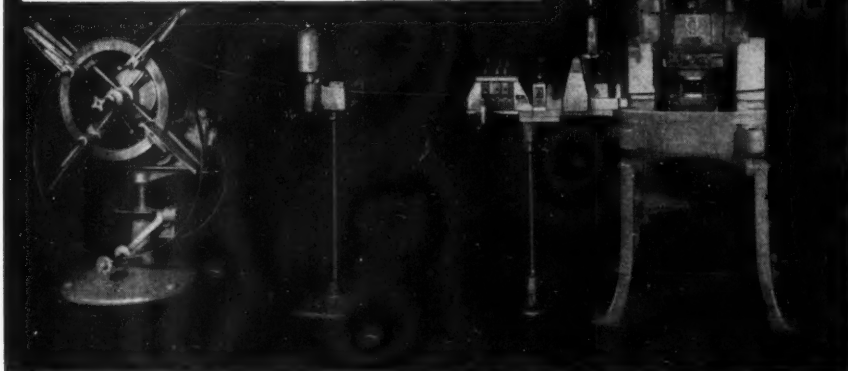
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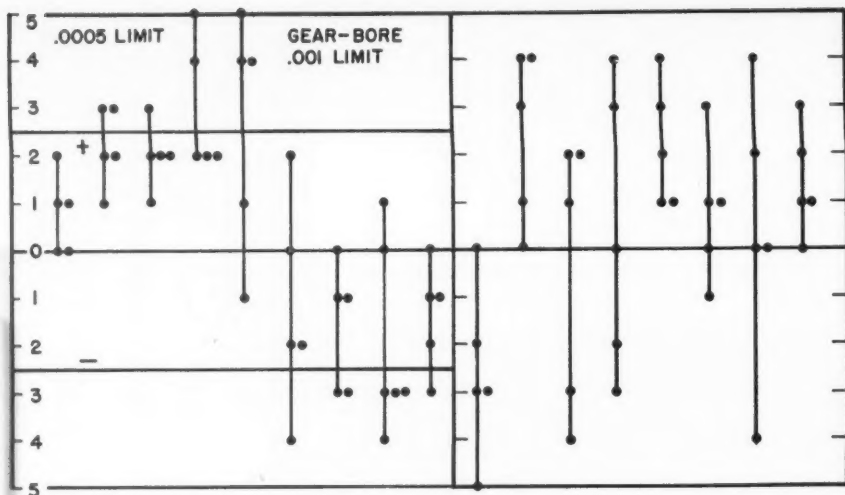


Fig. 10—This dot chart of individual pieces is the record of the bore size on a crankshaft gear.

gear and ends at the outside diameter of the gear. The three standard deviation limits signified by the heavy line marked "3 S.D." in Fig. 9 can be applied to total variation of involute deviations from point "1" to point "2" on curve construction in Fig. 8.

Analysis charts of this type determine the practical operating tolerance limits for a present method from which a standard is set. Not until going through this procedure on the elements of involute, lead error, interference, runout, and so on, are we ready to cor-

relate the gear difficulties found at the end of assembly lines with the elements of gear processing. When these standards are established and held constant, it is possible to experiment with a change of one element at a time for its effect upon assembly conditions in the completed gear train.

Statistical Records are Valuable to the Engineering Departments

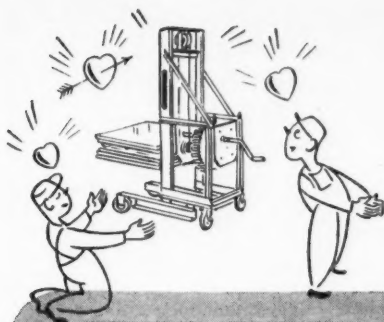
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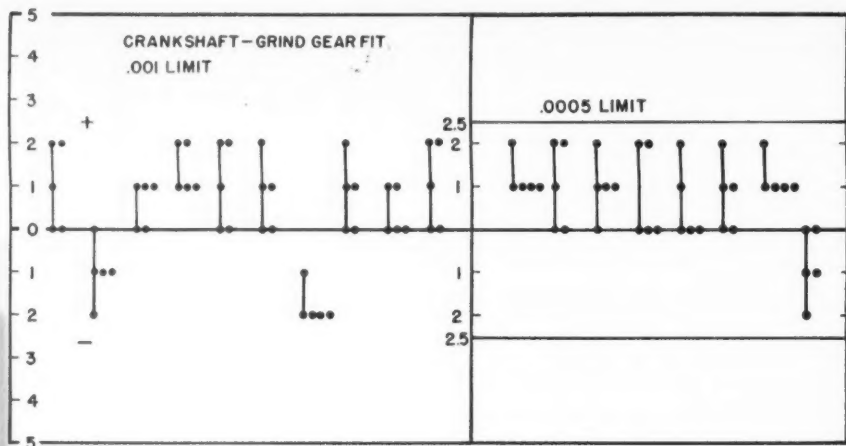


Fig. 11—Illustration of a dot chart in which the dimensions on the crankshaft having .001 tolerance were not being utilized.

tion, it is recommended that gaging be set up in the same fashion. In the case of a bore 1.249 low limit and 1.250 high limit, the ring gage is made as close as possible to the 1.2495 middle dimensions. Basically, the motive is to invite a large portion of production to center around the middle of the limit. This is the dimension from which the mechanical engineer originally designed the part. The engineer would, if possible, give this middle dimension only, because he thinks bitterly of the old shop practice of holding a bore to the low limit and the O.D. to the high limits.

The experienced shopman realizes the truth of the engineer's thinking.

We hope it is now clear in the reader's mind that the machine operator and inspector are instinctively being directed to produce at the center of the blueprint limit.

Another example of where Engineering Departments benefit jointly from the use of Inspection Statistics is the case of a crankshaft timing gear fit to a crankshaft. The dot chart of individual pieces in Fig. 10 is the record of the bore size on the crankshaft gear. The .0005 in. tolerance on the bore of this

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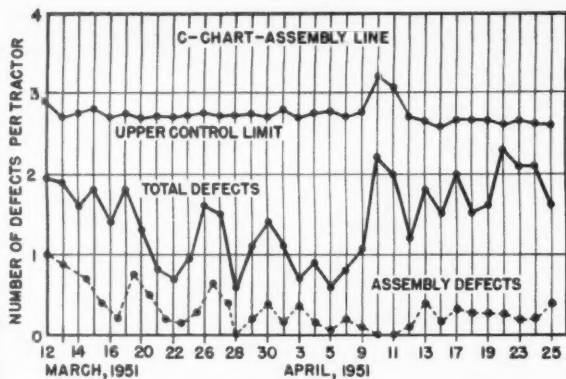
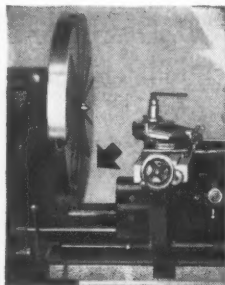


Fig. 12—Illustration of a "C" Chart or a "defects per unit" record.

steel gear could not be held by the present method of machining. Of course, the tolerance could be held by adding cost to the operation, but adding cost is a poor solution to any problem in this day of keen competition. An apparent avenue of escape can be seen on the dot chart Fig. 11 where the dimensions on

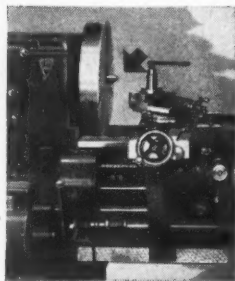
adding cost to the cylindrical grinding operation. Upon request, the Engineering Department changed to a .001 tolerance on the gear and .005 on the crankshaft. In new designs and specification change requests, these inspection records are available and valuable to Engineering Departments.



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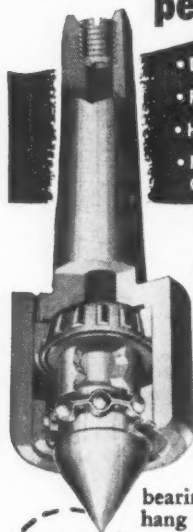
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Assembly and Service Needs Inspection's Records

Fig. 12 is a "C" Chart or a defects per unit record. The data for this chart is taken at a treadmill by two inspectors at the end of the assembly line where the tractor is driven in all speeds under load to simulate road conditions. The defects on tractors are

SINGLE SAMPLING—AOQL 1%

LOT SIZE	STANDARD		REDUCED	
	Sample Size	C	Sample Size	C
100-450	36	0	36	0
451-1500	84	1	36	0
1501-3750	135	2	36	0
3751-8000	190	3	84	1
8001-15,000	250	4	135	2
15,001-28,000	315	5	190	3
28,001-50,000	380	6	250	4
50,001-85,000	445	7	315	5

Fig. 13—Illustration showing a sampling chart of the type commonly used in Receiving Inspection.

then repaired and submitted to final inspection before shipment. Plotting the assembly defects separately from other defects, such as machine, foundry and purchased material, makes the chart Fig. 12 more effective. Notice the control limit for the statistician's use.

Key points of inspection are entered on assembly inspectors' check sheets. Any serious repeat complaint from the Service Department becomes a key point for inspection, also a part of the inspector's check sheet. Engines are taken from the assembly line at random and run on a dynamometer. This test for power and other perform-



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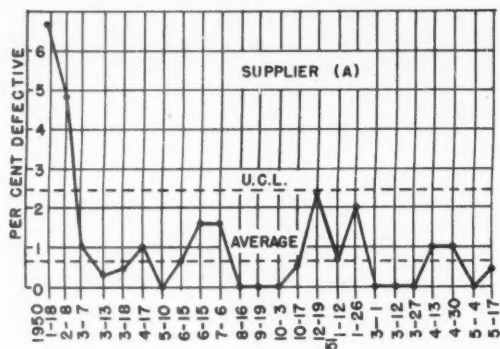
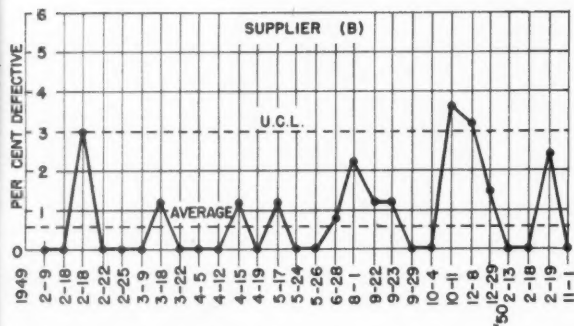


Fig. 14 — Illustration of a P chart on which a quality comparison of alternate suppliers may be made.



ance is recorded for future statistical analysis.

Receiving Inspection Aids Purchasing and Engineering

The Receiving Inspection Department in most companies carries a heavy burden. The largest proportion of tractor manufacturing cost is in our purchased material which passes through this phase of inspection. Here is a department which must test the reliability of suppliers. The materials vary in characteristics to further complicate the process.

Purchased materials are dollar-wise the greater cost of tractors. Therefore,

the concentrated efforts of Engineering and Purchasing Departments are directed to the files of Receiving Inspection.

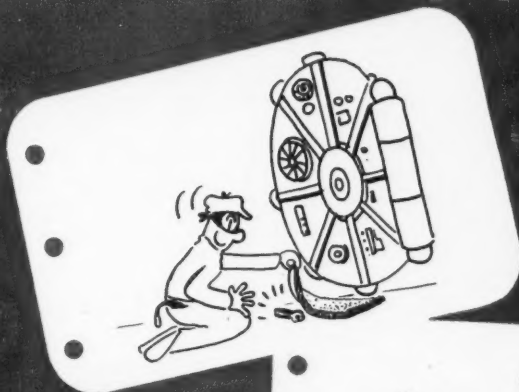
Our particular Receiving Inspection Department had always employed the old system of spotcheck. With the advent of Quality Control sampling tables, many helpful sampling methods were adopted. The advantage over spotchecking is that the quality control tables can be used to assure uniformity of inspection of parts from one shipment to the next, also for the uniform

comparison of alternate suppliers. Caution must be exercised in obtaining randomness here more so than in shop inspection. No allowance for error other than that calculated in a reliable sampling table dare exist when a purchasing agent is to choose between suppliers or calculate true savings. False analysis may wrongly remove a supplier from the approved list.

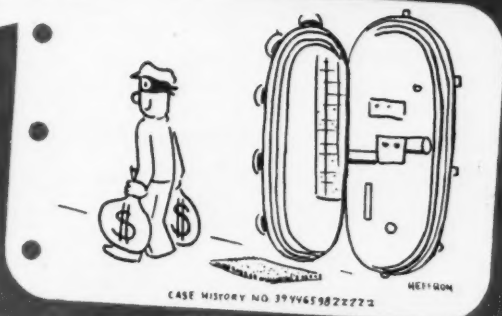
The Receiving Inspection supervisor has a wide variety of tables which he selects according to their respective risk factor. Here he applies his experience to determine the seriousness of a defective part getting into the finished unit. If this defective part is apt to be noticed

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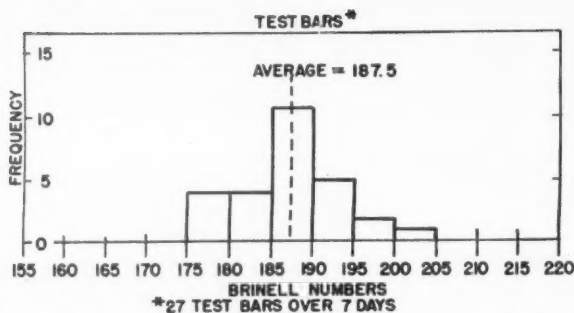


Fig. 14—Illustration showing the use of a bar chart in foundry operations.

rather than face the return of the defective shipment.

Fig. 13 shows a common sampling chart used in Receiving Inspection. For an

example, if we wish to explore a shipment of 300 parts we would use the first lot size given (100 to 450 pieces) in Fig. 13 which shows that a sample of 36 pieces would be selected at random from the shipment. If no defects are found as indicated in the "C" column, and the suppliers' dependability based on the record provided in Fig. 14 is known to us, we are 99 per cent sure

in the assembly or other inspection operations at no extra cost, the sampling plan can be more liberal. If a defect is of a critical nature and would escape detection in processing, the shipment would be explored by a tight sampling plan. The result of using this tight sampling plan may necessitate the sorting of entire lots. In many cases, the suppliers will stand the cost of sorting



A BETTER BORING BAR

OUR fine list of Customers is PROOF that our method of broaching square holes makes a better fit for the tool bit. This means more rigidity and longer life especially with tungsten Carbide. We also make bars for our Type B and Type C cutters or a combination of tool bits and cutters. Bars are made to suit customers' requirements as to method of drive, pilot, number of holes, angle of bit, etc. Our two-bladed cutters can be floated in the bar or held rigidly. Cutters are interchangeable—hence can be ground in an arbor in the tool room and only require a few seconds for inserting in the bar.

Square hole sizes range from $\frac{1}{8}$ " up to and including $\frac{3}{4}$ ".

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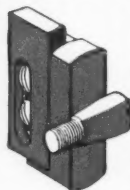
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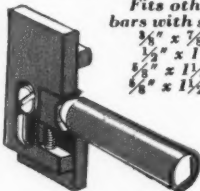


"B" A strong rigid serrated 2-bladed cutter—located in the bar with a taper pin. Bore holes accurately to close limits. Can be expanded and reground giving long life. Sizes $\frac{1}{8}$ " dia. up to 6".



"C" A simple 2-bladed reaming cutter. Can be expanded and reground. Located in the bar by a hardened V. This V never has to be reground as blades are expanded.

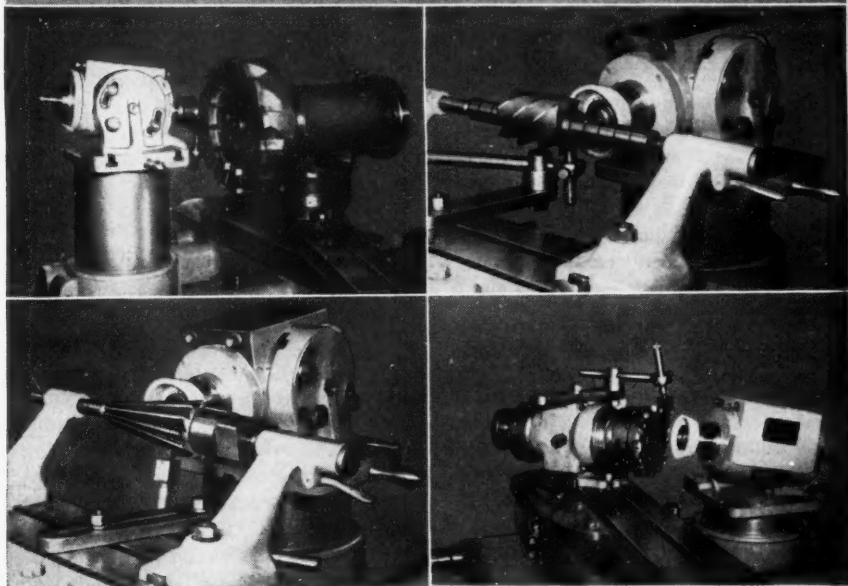
Fits other bars with slots
 $\frac{1}{8}$ " x $\frac{1}{8}$ "
 $\frac{1}{4}$ " x $\frac{1}{4}$ "
 $\frac{3}{8}$ " x $\frac{1}{2}$ "
 $\frac{1}{2}$ " x $\frac{3}{4}$ "



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This POPE Motorized Tool and Cutter Grinder SPINDLE



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POPE Spindles have the radial and axial rigidity to make wheels cut faster — spark out

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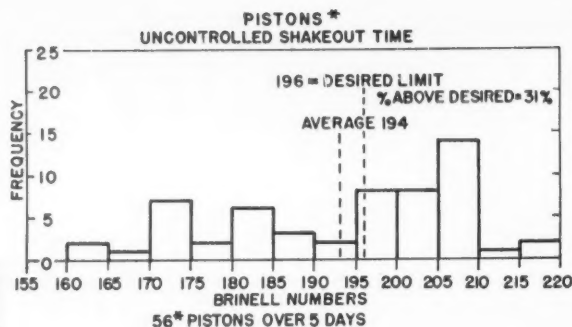


Fig. 16 — Bar chart showing plotting of 56 pistons tested over a period of five days.

that these parts contain no more than 1 per cent defectives.

When more than the allowable (C) defects are discovered, the inspection supervisor makes a decision and disposition based on his experience and use of established procedures. The inspection supervisor must have sufficient knowledge in the application of these parts to classify them as major or minor defects.

Fig. 14 illustrates a quality comparison of alternate suppliers on P charts. The P chart shows the average per cent defective with an upper limit calculated statistically. Each plotting represents the per cent of defective in the individual shipments on the dates below the plottings. Notice particularly the improvement made by the supplier in Fig. 14. After the supplier is proven dependable and within satisfactory

recommended because even a reliable supplier may send a batch of products on which an operation or final inspection was missed.

Foundry Shakeout in Relation to Hardness and Machining Problems

The use of bar charts in the foundry which are called frequency distributions by the statistician is illustrated in Figs. 15, 16, 17. The piston machining department complained of hard castings. The machining of hard pistons could be overcome by carbide tooling if the batch or lot of pistons to be machined were reasonably uniform in hardness. By Fig. 15, it may be noticed that the test bars taken from the piston molds are a little on the high side of hardness, but in the 27 parts listed in 7 days the spread is not too great. In Fig. 16, when 56 pistons were tested

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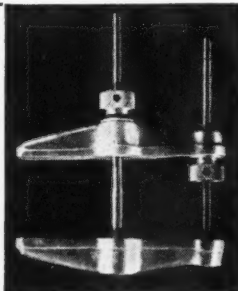
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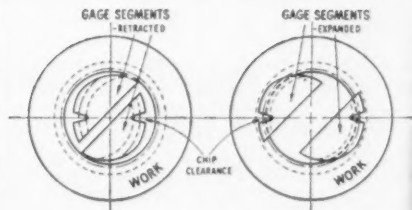
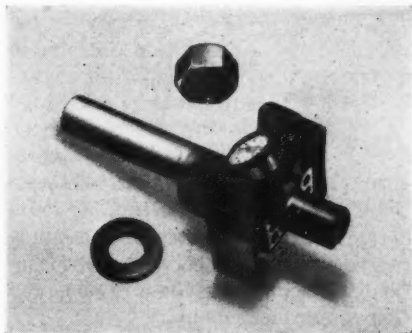
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The new Bryant Internal Thread Gage will check parts 4 to 5 times faster!



Plug segments are collapsed so gage may be inserted or withdrawn without threading.

Plug segments are expanded to give full length contact on all the threads.

The new Bryant internal thread gage is based on the principle of a split plug gage. The plug segments are collapsed by a thumb lever and inserted into the threaded hole. When the thumb lever is released, the plug segments expand to contact the internal threads in the parts being inspected.

This new gage is portable, therefore, threads may be checked while the part is chucked in a machine, and it offers extra convenience when inspecting threads in large, heavy casting that cannot be moved conveniently.

The Bryant gage is designed to give one accumulated reading of P. D., form and lead on the dial indicator. For the first time it is now possible to sort parts into

known classifications for fit (assemble-ability). This gage is used for the inspection of internal threads in a range from $5/16"$ to $1"$ diameter. Interchangeable segments are easily attached to the gage to cover a wide range of thread sizes. These segments are made to the same tolerances in P. D., lead, and form as a Class "W" Master. The life of the segments is lengthened by the fact that the gage does not have to be screwed into or out of the threaded hole — a partial turn gives a full reading on all the elements of all the threads.

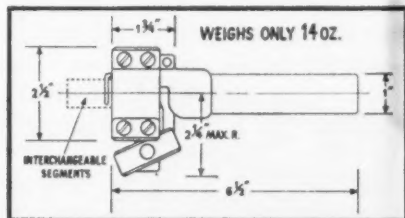
Actual tests show that the Bryant portable internal thread gage will check parts four to five times faster than the standard plug gage!

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CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

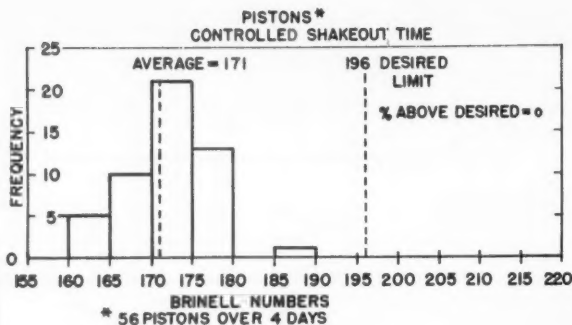


Fig. 17—This bar chart indicates improved conditions after shakeout time was correlated to the desired piston hardness.

over a period of 5 days we have a different story. Not only have we a higher brinell but a terrific range. As an experienced machine operator can appreciate, this caused a change in size from one piston to the other, due to the difference in tool dwell and resistance to tool feed pressure. Holding close tolerances on piston ring groove widths was impossible and the other dimensions difficult to hold. The foundry supervisor and the foundry Quality Control technicians by comparing the charts in Figs. 15 and 16 decided that the fast cooling rate of the thin metal sections in the pistons was causing the difference in brinell analysis between the test bar and the piston. This could and did happen in the time allowed between pouring of metal and shaking the casting out of the mold. Notice the improv-

ed condition indicated in Fig. 17 when the shakeout time was correlated to the desired piston hardness. The range of hardness is now narrowed to eliminate these machining difficulties. The foundry found that statistics were a handy tool in many problems. Better cooperation can be obtained between shop and foundry through its use.

Statistics Can Improve Your Inventory

Taking inventory presents a problem of accuracy in counts, operation numbers, proper identification of parts, and so on. Actually in our case, the counting is done by newer help. The older help with years of seniority will be on vacation at this time. Quality Control sampling tables can be used as effectively in checking these accuracies as in checking the reliability of suppliers or machine processes. Scientific sampling can replace the double and triple count in many cases.

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For "push-pull" work-holding jobs where considerable pressure is needed. Compact; up to 4000 lbs. capacity.

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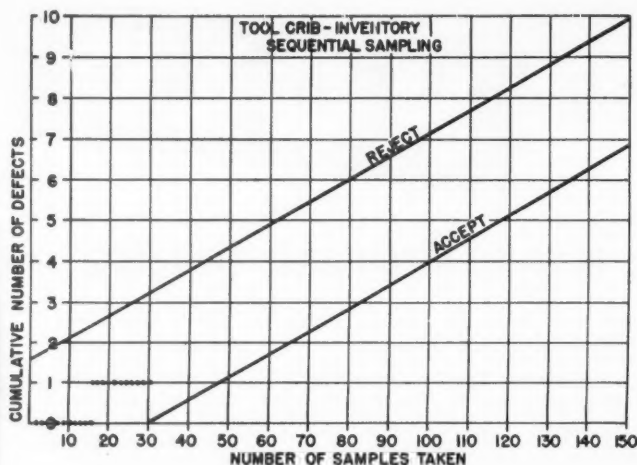


Fig. 18 — Illustration showing the inventory accuracy of an entire department.

This operation of testing inventory accuracy is done by following the counters, and checking at random so many bins or loads in a section for whatever elements are necessary.

Sequential analysis is ideal for this application. Fig. 18 illustrates the inventory accuracy of an entire department. After plotting one defect on the sequential sampling chart, a series of good counts led us to believe the inventory was properly taken in this section.

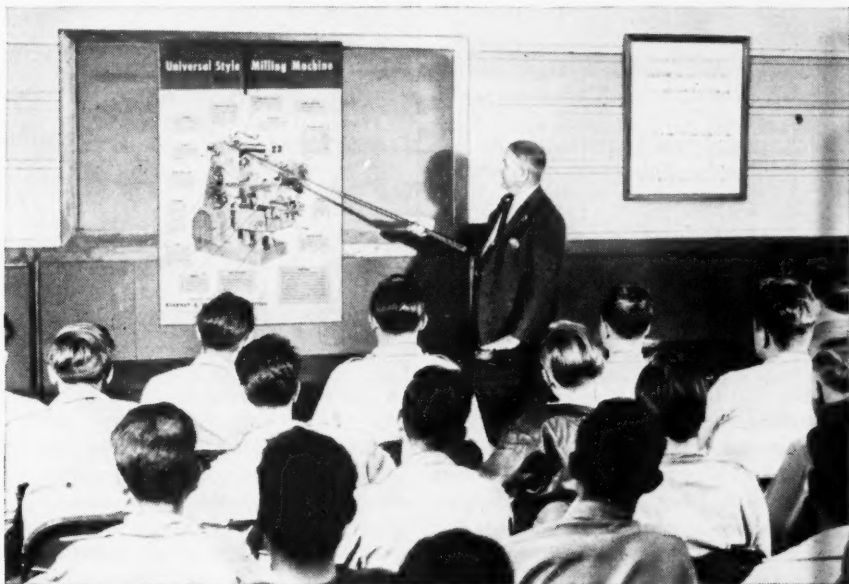
Statistics in Methods and Tool Design Departments

Statistics can play an important part in the development of standards. A quality standard must be maintained at a competitive level. Above this level, you have unbalanced cost of production. Below the established quality level you meet with service calls and sales resistance. The Methods Departments play an important role in standard costs. A Methods Engineer when called to revise a production standard is, of course, reluctant to add cost to a ma-

chining operation. He will find the case histories in the Inspection Department's records helpful.

Let us relate our experience in correcting the method of boring a 1.4995 in. \pm or $-.0005$ in. diameter in a gear blank. The steel was SAE1045 heat treated to 197 to 230 Brinell. This operation was set up on a Heald Borematic. The control chart Fig. 19 indicates periodic out-of-tolerance bores. The worksheet contained notes describing these out-of-tolerance dimensions to be only in small sections of the bore. The inspection supervisor acting as analyst cut a small section from one of these gears and had the plant metallurgist photograph this section, as shown in Fig. 20. This photograph magnified 75 times checked the consistency of hydraulic feed and amount of drag on the tool when the spindle is retracted. This enlarged picture showed indications of tearing. The result of this analysis was turned over to the Tool Design Department for assistance. Experiments with tool clearance made no appreciable improvement. Cutting the surface speed

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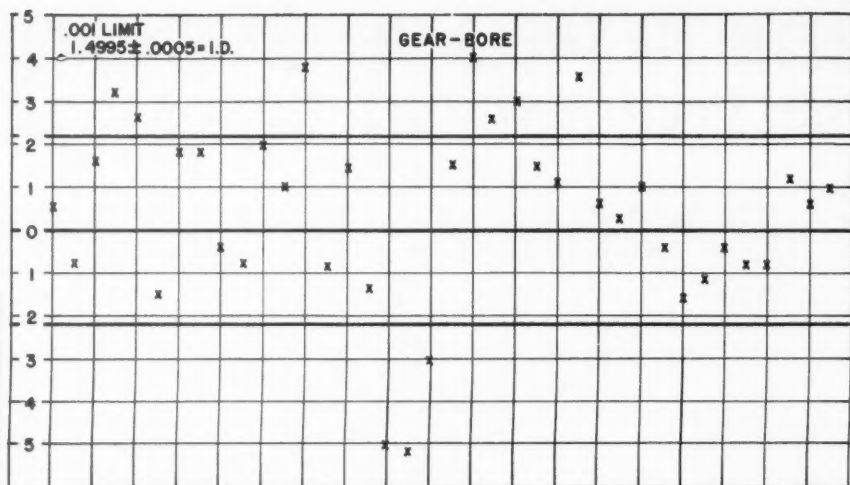


Fig. 19—This control chart indicates periodic out-of-tolerance bores.

of the tool from the present 300 ft. per min. also failed. Finally, the r.p.m. of the spindle was increased to give the tool a travel of approximately 600 feet per minute. The tool feed was changed from .004 to .006 and a double negative rake angle was ground on the tool bit. As a result, through the use of statistics and cooperation between departments, the quality standard was met. This also resulted in a lower cost which was applied to other tractor parts of similar design.

A Note to Management in Summary

Statistical Quality Control is not an Aladdin's Lamp nor does it remove risk in existing operations. It is a tool to be used by people experienced in their particular method of manufacture after they have been indoctrinated in the basic statistical techniques. The risk factor and defects in your manufacturing process will be shown accurately from statistical records. Judgment and experience must guide the su-

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1. Eliminates "guesswork"—automatically centers work at desired point on machine table—particularly useful where outside dimensions of work vary.
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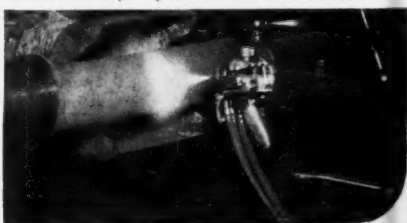
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Salvaging worn feed roll journal for textile mill.

Building up 6" dia. by 12" lg. bearing section on shaft from heavy duty crusher with .25 carbon steel.



New Metco Type 4E gun sprays 40% faster than older models; produces uniform coatings with minimum operator skill; lower cost operation with minimum maintenance.

Here is another Metco development that makes metallizing a still more profitable tool for the modern machine shop. It's the new Metco Type 4E Gun. With the older types of metallizing guns, constant operator attention was required to maintain oxygen and gas pressures within a close range to obtain uniform coatings. Now, with this new gun, gas pressures are automatically balanced against variations as great as 10 lbs. Now, so little operator attention or skill is required, that the gun almost runs itself.

In addition to this advantage, the Metco 4E gun sprays up to 40% faster than older models. Wire feed is also controlled automatically for any wire size, from 20 B&S gauge to 1/8", in any metal.

Add to these advantages the recent development of the new metallizing material, Sprabond Wire, which bonds itself to smooth steel surfaces without any mechanical preparation except cleaning. It serves as the perfect preparation coating for spraying with any other finish metal.

Free Bulletin or Shop Demonstration—Send off the coupon below for detailed information. Or, better yet, ask for a demonstration in your own shop by a Metco Field Engineer. He will be glad to show you how the new Metco 4E gun works on jobs of your own. No obligation, of course.

The following names are the property of Metallizing Engineering Co., Inc.: Metco*, Sprabond Wire.

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pervisor in either taking corrective action or allowing defects to continue if they are small and unarmful competitively. Last but not least, the Inspection Department with all its effort and statistical records is only as good as

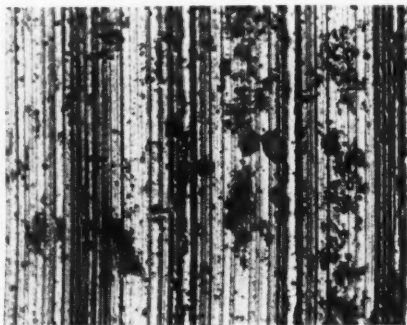


Fig. 20—Photomicrograph of gear section shows indications of tearing. Magnification X75.

the support and action is receives from top management and interrelated departments.



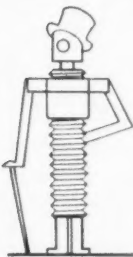
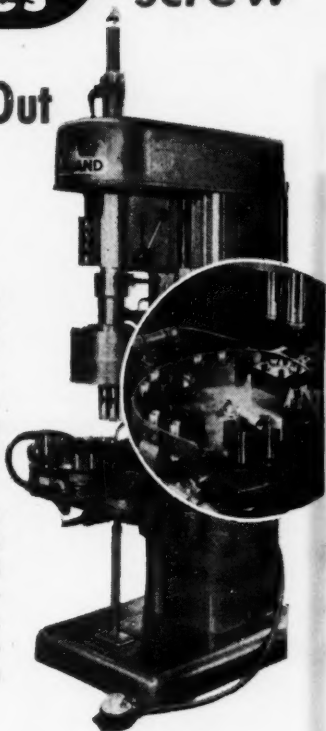
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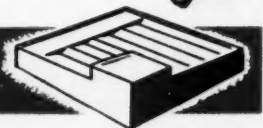
Mr. Lead Screw says:

Write today for your copy of the Cleveland Production Tapping Guide and a copy of Catalog W-9.

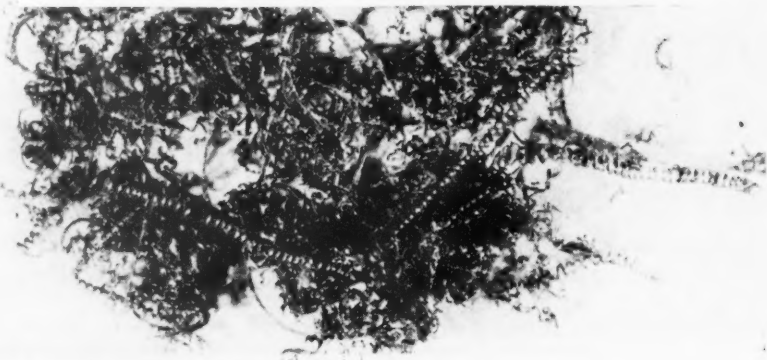


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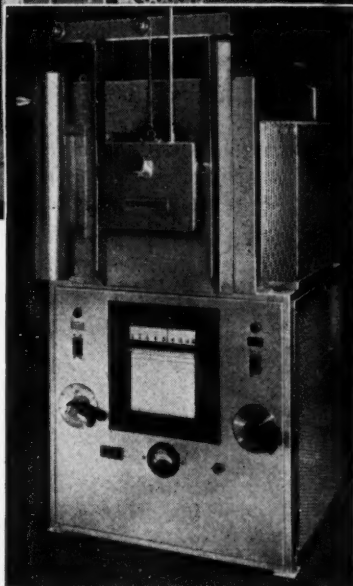
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Liberal Use of Gage Blocks Pays Dividends

In which the author suggests several practical methods of obtaining maximum use of gage blocks.

By H. J. CHAMBERLAND

Research Engineer, The DoAll Company

THE decidedly wrong concept prevailing a decade ago, as to the advantages of wider distribution of gage blocks around the plant, had taken a most encouraging turn for the better by the end of World War II. Although the metalworking industry has since reacted more and more favorably to regularly publicized facts and figures, proving that every additional set of gage blocks means better quality control, this endeavour has not as yet

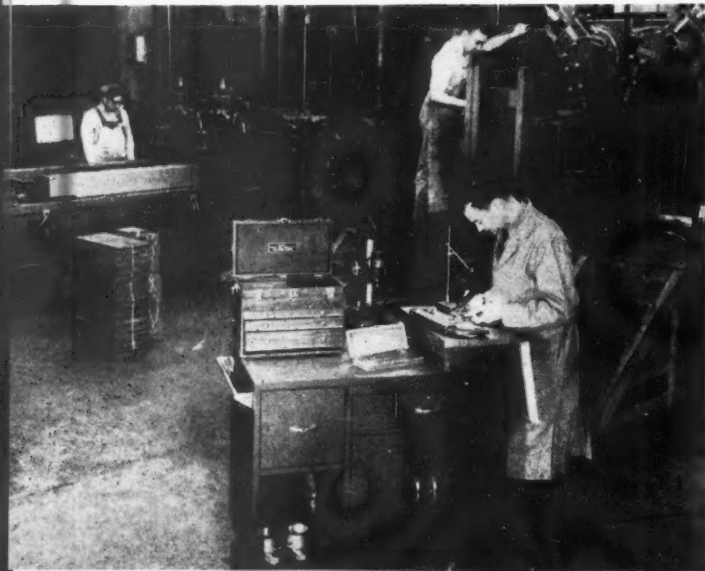
proved 100 per cent beneficial by any means. However, the necessity of more efficient inspection programs and particularly a substantial increase in the use of gage blocks in the course of production will become more convincing as the present emergency requirements are stepped up.

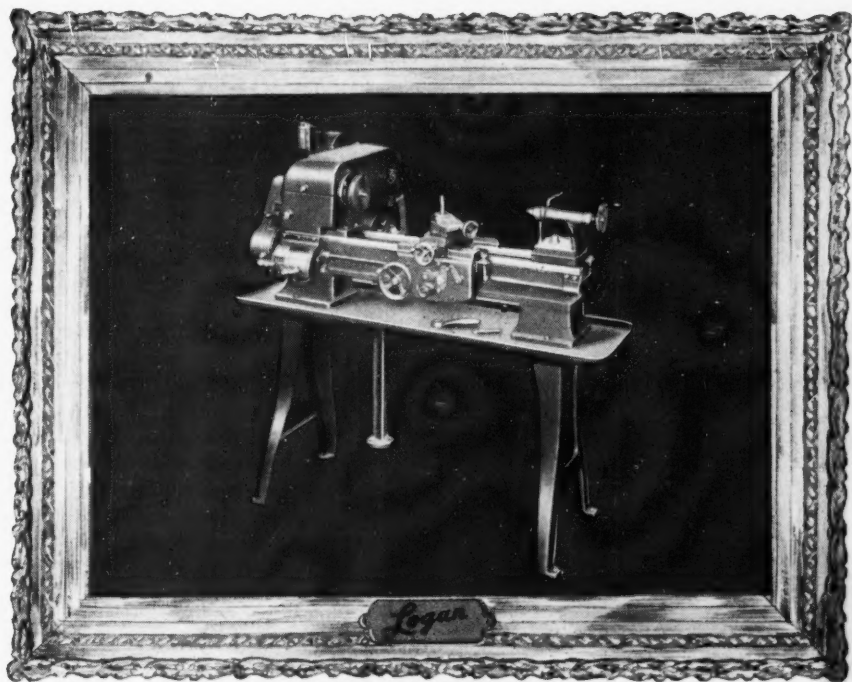
It is true that the larger plants have long realized the economy of using gage blocks as freely as possible, in connection with tool, die and jig making and

on production lines as well, even though manufacturing equipment is of the most modern type. In this latter instance, complete sets of working quality or "B"



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With Logan Lathes you are ready for every type of lathe operation. Heavy cuts, tool room precision jobs, high speed production runs and large volume second operation work are all routine Logan assignments. Versatility is inherent in the Logan ball bearing spindle with its wide speed range and sustained accuracy; in the accurate, rugged overall construction of Logan Lathes; and in the full line of Logan Lathe attachments. 11" swing, 1" collet capacity and 1 1/2" spindle hole are typical of the speci-

fications which make these accurate Logans capable of handling a high percentage of any shop's lathe turning. Easy to set up, simple to operate, frugal with power and durable, Logan Lathes economize every way you use them. In fact, no other lathe of comparable specifications can match the Logan in economy.

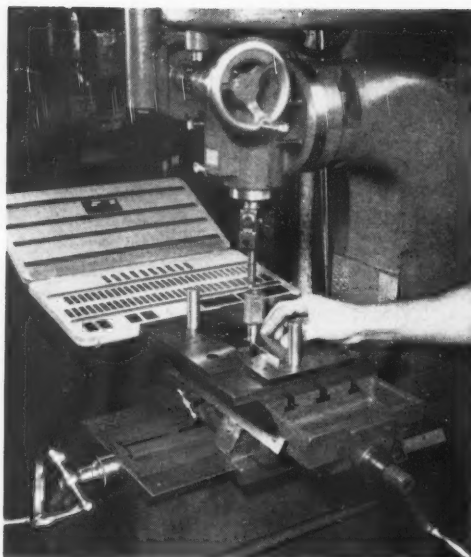
WRITE FOR THE
LOGAN LATHE AND
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LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.

4901 West Lawrence Avenue, Chicago 30, Illinois

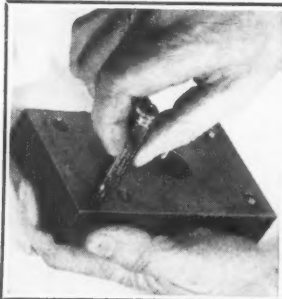




Tool maker checks results of jig boring operation with "working" quality gage blocks which are accurate within plus or minus 8 millionths inch when new. The blocks are regularly demoted according to wear and used for various machining operations. The fact remains that a block worn 80 millionths inch is yet more accurate than any other measuring tool calibrated in tenths of a thousandth inch.

grade blocks are naturally given the preference because of their reasonable cost, accuracy and long life, in comparison to single-purpose gages and other precision measuring tools and instruments. Where only a few sets of inspection quality or "A" grade blocks are used, these are periodically checked against laboratory quality or "AA" grade blocks; blocks not within the prescribed 4 millionths of an inch accuracy are sent to the tool room as "B" grades and replaced with new ones.

One large plant, for example, uses so many sets of "A" quality blocks that requirements for "B" blocks are to a great extent automatically taken care of. In fact, approximately 150 sets of gage blocks are now in current use throughout this plant. The blocks are given close attention for wear and they are classified and re-classified accordingly as follows: Class 1, under 20 millionths inch error; Class 2, over 20 but under 40; Class 3, over 40 but under 80 millionths inch error. Class 1 sets are reserved for gage making; these are eventually demoted to Class 2 sets for tooling projects requiring somewhat less precision and the latter are, in turn, demoted to Class 3 and released throughout the plant, to provide operators with fool-proof set-up facilities or means to readily discern and correct



A REAL HELPING HAND

It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.

The Heimann Transfer Screw Set is a self-contained complete tool. No wrenches or pliers are necessary. Made in $\frac{1}{8}$ " to 1" diameters. Send for price list.



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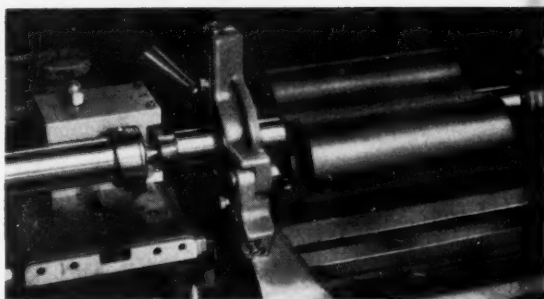
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URBANA, OHIO

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PRODUCTION or DIVERSIFIED JOBS

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(Material SAE 4140 Steel — 1 1/4" Dia. — 12P — Single Thread — 2 1/32" Length)

SEND FOR THIS CALCULATOR and you, yourself, will be able to estimate the speed with which the Cri-Dan would generate your own single start threading jobs.

YOU'LL QUICKLY APPRECIATE the advantages and economies of generating your threads with the revolutionary Cri-Dan Single Point machine.

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ALL TYPES OF THREADS up to 4" maximum external . . . 6" maximum and 1" minimum internal . . . can be generated with the Cri-Dan.

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The **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO, U.S.A.



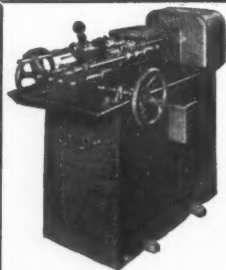
Mobile inspector checking accuracy of jig grinding operation. Many of his gage blocks have an accuracy quite comparable to that of laboratory quality blocks and this is particularly true insofar as surface finish and flatness are concerned.

operator can control the functions of his machine and cutting tools. In this latter instance, the less dependable the equipment and more limited the dexterity of the operator the greater the need for gage blocks.

any possible error which might unexpectedly develop and for which they are likely to be held responsible in most cases.

To date, no particular quality control system has been universally adopted and therefore it is only natural to assume that some are by far more effective than others. However, two essentials for highly effective quality control have no substitutes in this high speed age, namely; (1) Closer and more frequent inspection of work being processed. (2) This first requirement brings results only to the extent to which the

The Mobile inspection system supported by an adequate number of sets of "B" grade gage blocks, varying in quantity and nominal sizes to suit production line needs if desired, definitely represent the most effective quality control team to be set into action in any plant irregardless of its size. The Mobile unit is truly a complete inspection department on wheels, regularly rolling along from machine to machine with one or two inspectors making the better use of their set of "A" grade blocks and related accessories such as the gage holders, surface plate, com-



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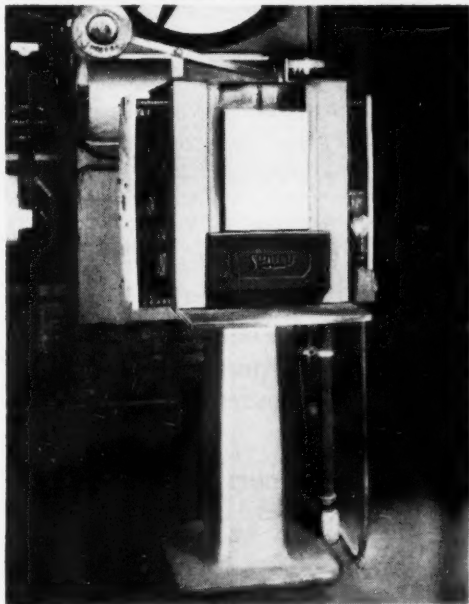
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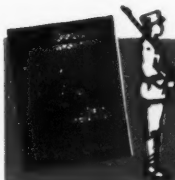
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For small tools, cutters of moly, tungsten and cobalt high speed steels.



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MANCHESTER 2, CONN.
Manufacturers of helical taper pin, chucking,
die makers and special reamers.

parator, sine bar, caliper blocks and others to detect any error before it multiplies itself to the serious stage.

All makes of gage blocks are, of course, subject to a criteria established by the Bureau of Standards, as affecting flatness, parallelism, dimensional accuracy and surface finish. The fact



Determining wear on dovetail with "working" quality or "B" grade blocks.

remains that two factors are decisive as to whether or not the blocks will serve their intended purpose and for how long, one is **stability** and the other **surface finish**. Both are of extreme importance to the inspector and machine operator, otherwise, measurements could prove deceiving. As to surface accuracy, it should be mentioned here that the same superfinishing technique prevails regardless of grade of block concerned. Therefore, the surface finish of "B" blocks is usually quite compar-

NEW P-K Bulletin
tells how to
add more speed
to the faster
fastening method

POWER DRIVING

of P-K Self-tapping Screws

A wide range of Power Driving equipment is available for use with the various types of P-K fasteners—and with slotted, Phillips recessed, and hex head styles. And all types have this in common—a substantial reduction in assembly time and cost. *Parker-Kalon does not manufacture power-driving equipment, but has tested many devices in the P-K laboratory under production line conditions, and found them suitable*

for use with P-K Screws. The information contained in the "Power Driving" Bulletin is based on reports of these many tests.

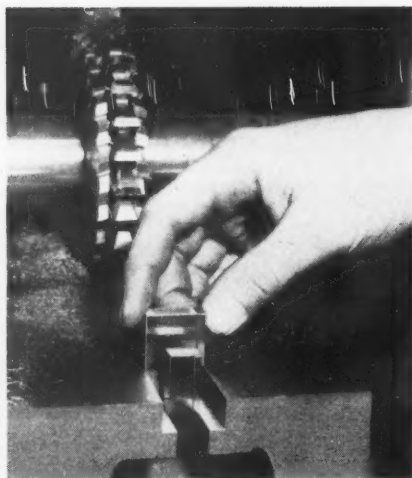
For specific information on power driving applied to your assemblies, talk to a P-K Assembly Engineer. Your P-K Distributor will furnish a copy of the Power Driving Bulletin . . . ask for Form No. 401. Or write: Parker-Kalon Corporation, 200 Varick St., New York 14.



Describes and illustrates the various basic types of electric, air-operated and impact tools, as well as the automatic hopper-fed machines for screw driving in common use. Helps you determine which type is best for your assemblies. Also includes useful information on proper bit and socket selection. Free on request.

The Original
PARKER-KALON[®] SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY



Checking accuracy of compound milling cut. The blocks are also used to set depth of cuts.

able to that of "A" blocks but in any case the variation will not exceed one millionth inch—R. M. S.

Stability — It's True Meaning

One of the insidious qualities of some gage blocks is their inability to remain the same size over long periods of time. This size change comes from a condition within the steel in which the form of crystallization gradually shifts from one phase to another. The crystal form

in one phase known as "Martensite" is needle-like in shape while its fraternal twin "Austenite" is more rounded. Due to this structure, a change in volume takes place as the crystal form changes. The balance is such that the shift can be either one way or the other. In either event, if entire gage blocks change in size, we call them "growers" and "shrinkers".

Whether they are shrinkers or growers, such gage blocks will bear watching. Some 3 in. and 4 in. blocks can shrink .00001 in. in a month, this condition has been known to exceed .0002 in. in a two-year period thus rendering the blocks worthless although they had been used but a few times. On the other hand, the grower block is more difficult to spot and particularly so if substantially offset by wear through daily use. Regardless which way the blocks go, it means trouble since the change is never uniform and causes warpage and distortion which certainly effect wringability to complicate matters when the blocks are used in combinations.

According to the Bureau of Standards, a gage block should retain its original stability for at least six months and the following simple test has been devised to that effect: This consists of

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TIME and MONEY

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STOP-PINS
AVAILABLE IN 5 SIZES



FINGER STOPS
IN 3 SIZES

STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices.

SUPEREAM FINGER STOPS made in uniform width to fit any standard width slot. Just grind ends to fit.

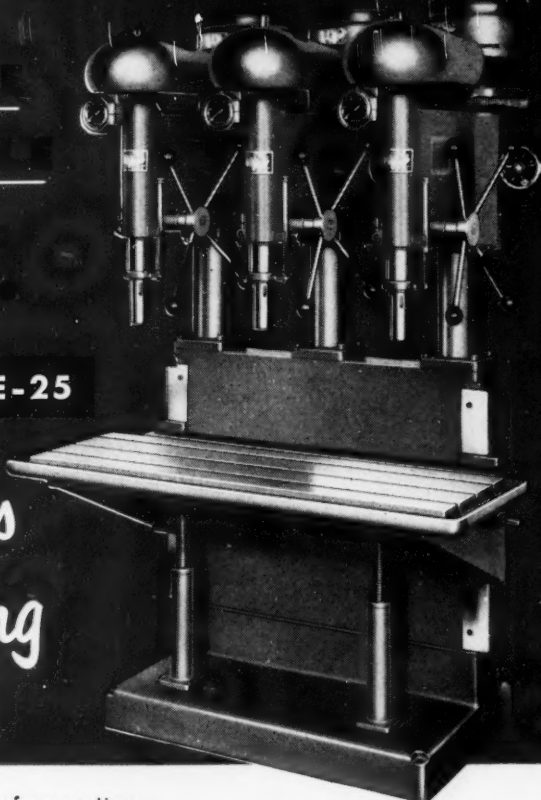
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MANUFACTURING CO.
3724 MONTROSE AVENUE
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THREE
SPINDLE
drilling
machine

SIBLEY ME-25

*Slashes
handling
time!*



Work-handling consumes far more time than work-cutting in producing many jobs. To reduce manual effort by one-half increases production far more than by faster cutting speeds. To make this improvement without burdening the operator—in fact to make it easier for him—is the chief advantage of

the new Sibley Model ME-25.

The variable speed drive, the big 25" swing, the extra large table, the convenient speed controls, the handy tachometers, all combine to make this 1" capacity, medium weight machine a production advantage in any shop!

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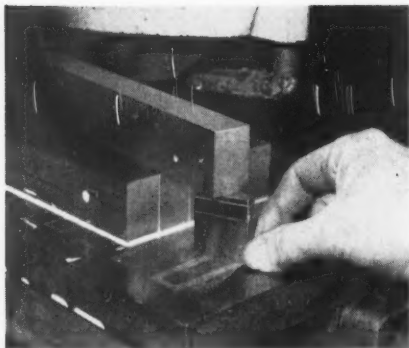
SIBLEY MACHINE & FOUNDRY CORP.
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With the use of gage blocks, parts being surface ground to close tolerance need not be removed from magnetic chuck to be miked. This not only saves time but provides a considerably closer measurement than otherwise possible.

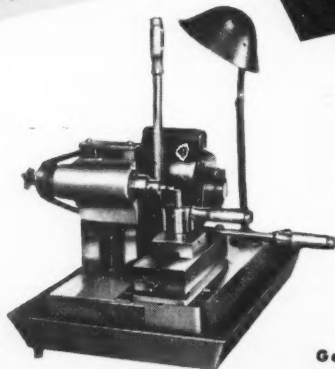
boiling the gage block for 24 hours in water to which a small amount of sodium bichromate has been added to prevent corrosion. If the gage does not

change in size more than 0.000002-inch, it is assumed to be stable. This stability test is most reliable but how to heat treat the blocks to meet it is something the gage block maker keeps to himself.

Surface Finish — Most Important for Efficient Wringability

The total measurement of a gage block combination, regardless of the number of blocks involved, must necessarily be representative of that of a single block. This is where surface finish enters the picture. The finer the finish and the longer its original degree can be preserved, the more lasting the accuracy and life of the gage blocks. To impart a .6 micro inch finish on gage blocks, such as now possible on "AA" grade or laboratory blocks, is one thing, but making possible a relatively well balanced similar precision on "A" and

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CONVERT SET-UP TO
LATHE, MILL or GRINDER**



MILL, TURN or GRIND
with NEW COMBINATION
VIKING LMG 3

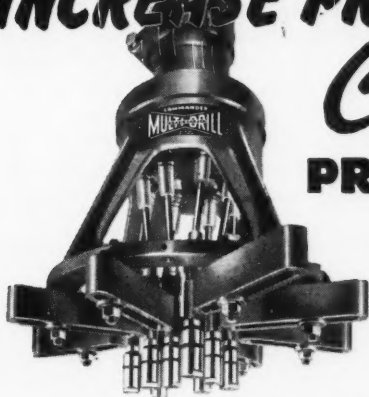
A versatile bench-type machine for small parts manufacture, combination or straight-line operation. 1" ball-bearing spindle, 825 and 3450 rpm., standard speeds (full range optional) 1/3 hp., 1725 rpm. motor.

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INCREASE PRODUCTION with *Commander* PRODUCTION TOOLS



You can drill 2 to 8 holes at one stroke of a MULTI-DRILL equipped drill press. Instantly and easily adjusted to any hole pattern . . . compact in design and ruggedly built for years

Adjustable **MULTI-DRILL**

- ★ DRILLS UP TO 8 HOLES AT 1 STROKE
- ★ ADJUSTABLE TO ANY HOLE PATTERN
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of service, thousands of MULTI-DRILLS are cutting costs and increasing output up to 800% wherever metal, wood or plastics are drilled.

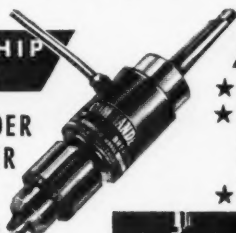
New DRILL CHIP BREAKER

Get these COMMANDER DRILL CHIP BREAKER

benefits now:

- Faster Drilling
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ORDINARY CHIPS

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COMMANDER TAPPER

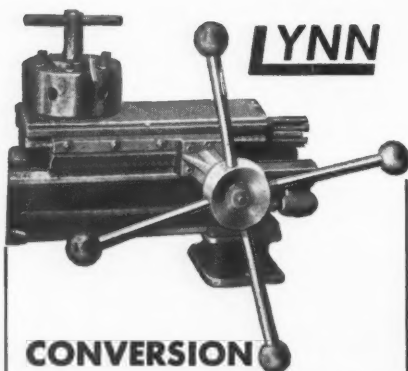
- ★ 1 Tapper Handles Taps #0 to 3/4"
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Commander Tappers "think for the operator"—automatically stop when taps are dull, overloaded, or when they strike bottom in blind hole tapping—permit faster tapping, better work, even with inexperienced operators. Torque control provides positive tap protection from #0 to 3/4" . . . spring clutch eliminates slippage, assures smooth, quiet, easy operation.

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Convert your engine lathes for turret work. Put your idle or unproductive lathes into full-capacity production — *At Once*. Lynn conversion turrets are easily and quickly mounted on your present lathes—all set and ready for full-capacity, close-tolerance production, just like new turret lathes, but at a small fraction of the cost.

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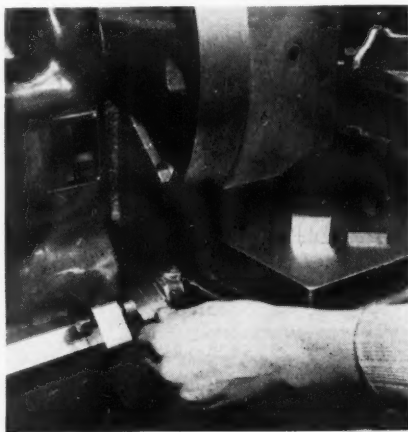


MANUFACTURING CO., Inc.
1121 So. Seventh St., Minneapolis, Minn.

Write,
Wire,
Phone

"B" blocks worthwhile to the customer and in turn to the inspector or machine hand is another.

The beautiful optically flat mirror surface accurate to within a few millionths of an inch is something that has been admired and appreciated by all good mechanics. But the gage maker who himself has produced these

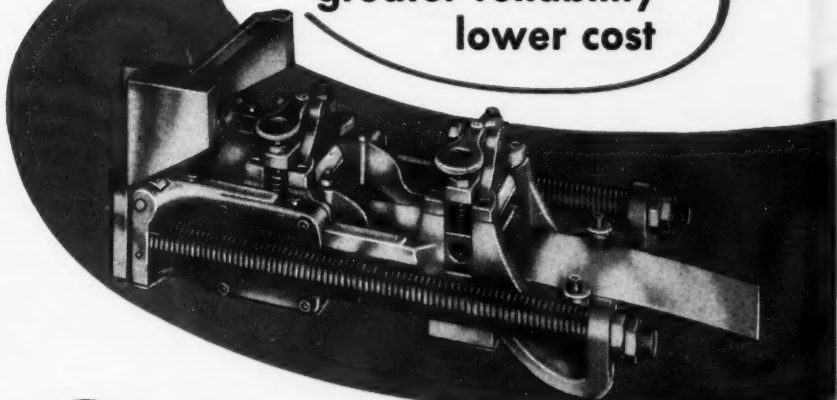


Setting depth of lathe boring operation. While these blocks have worn close to 50 millionths inch the measurement derived is at least 10 times more accurate than that possible by any other means.

planes of perfection best appreciates the fine technique, the patience and skill that makes possible the gage block as we know it today. It may be that this attitude toward his own finished work has until now prevented the gage maker from providing the final steps to insure even greater life and utility to his gages. It is a general rule in the gage block industry that after final lapping, no further mechanical operations be performed. Once the infinitesimal tolerance of accuracy for size, parallelism, flatness and surface finish are obtained, the slightest mechanical op-

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greater reliability
lower cost



Dickerman 3 in. DIE FEED

The amazing simplicity and steady reliability of the 3" Die Feed have made it a favorite with punch press owners everywhere.

Easy to install, it has no complicated parts to get out of order, adjustments are few and simple and top quality material and workmanship assure millions of cycles without expense.

Can be mounted on die set or bolster plate to feed from any direction. Feeds coiled materials such as steel, copper, brass, aluminum, mica, paper, fibre, rubber, plastic. Will not mar smoothest surfaces.

Reduces human error factors to a minimum. No costly jams. You save labor costs, material costs, die repair costs. Will handle coiled stock of any practical combination of thicknesses up to 3/16" and width to 4" or 6".

FOR COMPLETE DETAILS

H. E. DICKERMAN MFG. CO.
Dept. K, 322 ALBANY STREET SPRINGFIELD, MASS.



Blocks being used to set depth of parallel cuts on this large planer have worn close to 70 millionths inch. As soon as they have worn another 10 millionths this is considered the end of the line and they can no longer serve the purpose for which they were originally intended.



lization, rounding all edges and corners all are completed before lapping. In fact, the gage blocks prior to lapping are barely distinguishable from the fin-

ished blocks except, of course, that they lack the mirror reflective surfaces. The

gaging surfaces would cause them to warp and distort. As a consequence, gage makers work up their blocks in practically finished form before lapping. Cutting to length, grinding all sides, heat treating, stabi-

lized blocks except, of course, that they lack the mirror reflective surfaces. The gage block, before lapping, has a well defined radius on each edge, the purpose of which is to insure against burrs which might occur if the gage

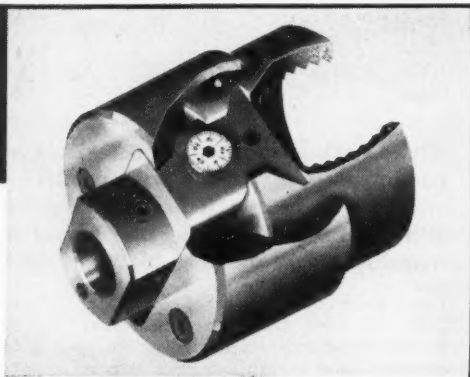
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THESE JOB-PROVEN FEATURES WILL
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Complete Boring Chuck
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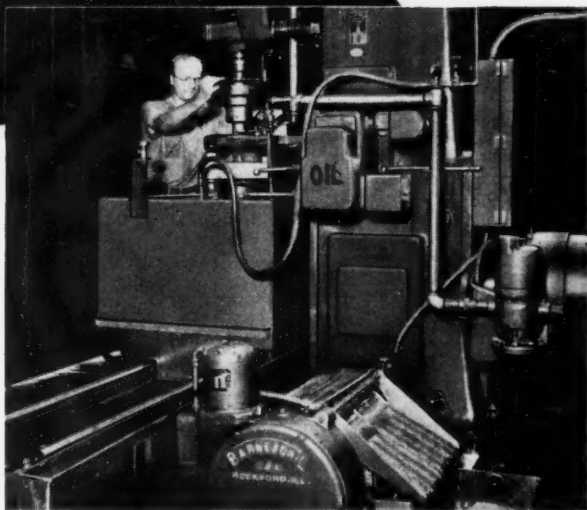


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Machine down-time due to maintenance, abrasive wear, tool dressings and coolant changes becomes negligible with the automatic action of the Separator in removing swarf and chips. Tool life and production increase, using the same equipment and man hours, as shown on this Honing application.

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**Write or wire for full
information.**

BARNES DRILL CO.

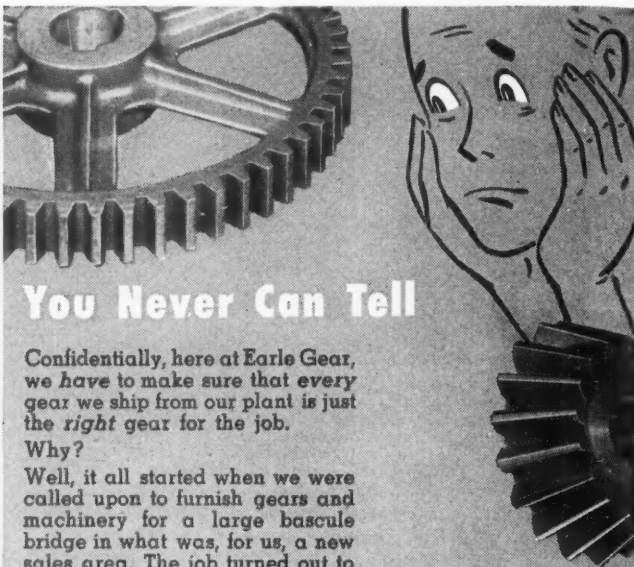
460 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

surface ended in an abrupt sharp edge. This, in theory, is correct but since the radius is ground on the gage block **previous** to lapping, the block there-after presents a different picture. In short, after lapping, the radius is not continuous but ends at a sharp edge where it intersects the lapped gaging surface.

The attrition of the lapping process is somewhat analogous to the honing of

a razor. As the surface wears away, a fine amorphous metal or wire edge builds up at the extremities of the surface being worked. Under the microscope, this edge appears as a series of fine jagged disconnected wires. They consist of metal forced out to the edge by the abrading particles used in the lapping process. As such, they are in the plane of the gaging surface and do not hinder the wringing qualities of the

gage if not disturbed. However, the slightest tap or blow by some hard tool or object is enough to bend one or more of the wirelike projections upward into the plane of the gage. A burr is raised, the blocks no longer wring and are inaccurate when used in combination. The burrs raised will vary in height but might well run from 10 to 25 millionths depending on the extent of the blow and the amount of wire edge on the block. In any event, a burr of over 2 millionths of an inch is enough to make them unsuitable for precision measurement.



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Confidentially, here at Earle Gear, we *have* to make sure that every gear we ship from our plant is just the *right* gear for the job.

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Well, it all started when we were called upon to furnish gears and machinery for a large bascule bridge in what was, for us, a new sales area. The job turned out to be a tough one—took most all the skill we could muster and more time than we could spare. But, it turned out to be worth it.

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It's good business to do business with **EARLE**.

EARLE  **GEARS**

REAMERS

Reamer Facts

Reamers are "Size" tools. When they become worn to the point of being undersize they must be discarded or ground to a smaller size. It follows that you will want to use reamers that will produce the greatest number of holes between grinds and also give the largest number of holes per reamer

Whitman & Barnes Reamers

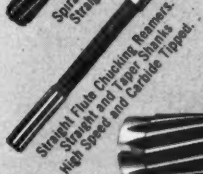
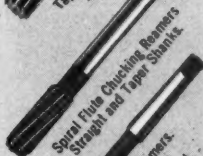
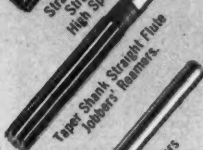
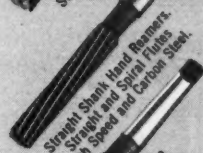
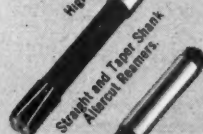
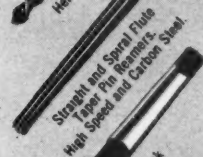
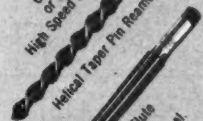
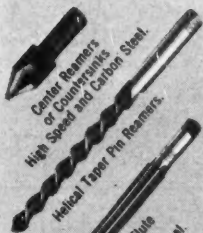
Whitman & Barnes Reamers are designed, manufactured and heat treated to produce a maximum number of holes before regrinding is necessary. They hold an enviable record for economical performance in many of the largest production plants here and abroad.

Then too, Whitman & Barnes stock line of reamers include types suited for practically every reaming operation. They can be obtained from reliable distributors everywhere. Special reamers made to your blueprint or specifications.



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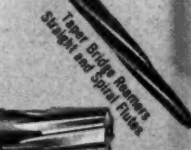
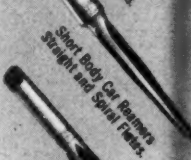
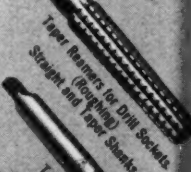
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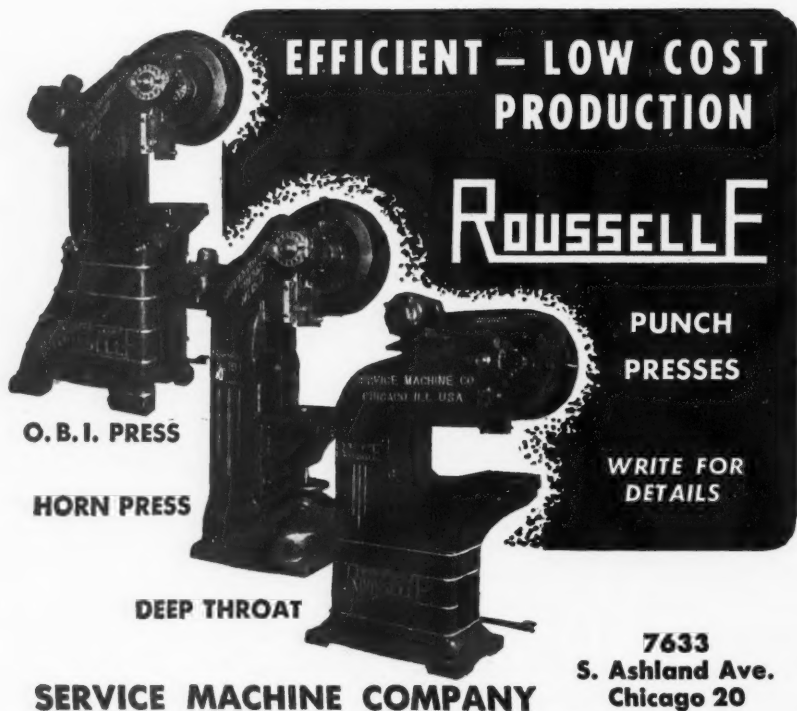
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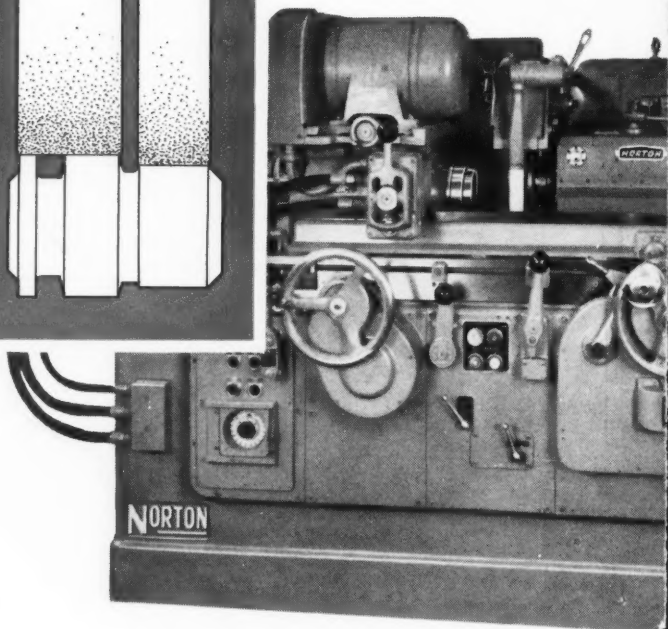
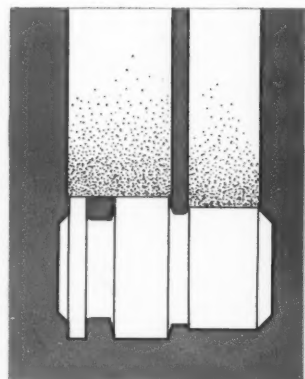
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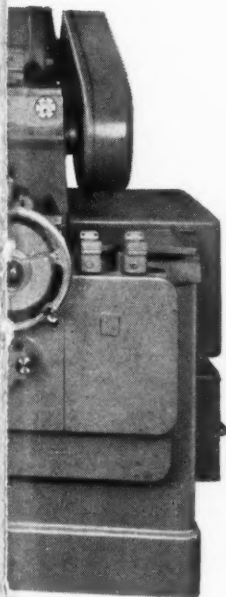
The Jacobs Manufacturing Company, Hartford, Conn., prominent manufacturers of chucks, desired increased output in the grinding of certain of their chuck bodies. Two diameters on each body were being ground in separate operations — at a production rate per hour of 150 of a small body and 130 of a larger.

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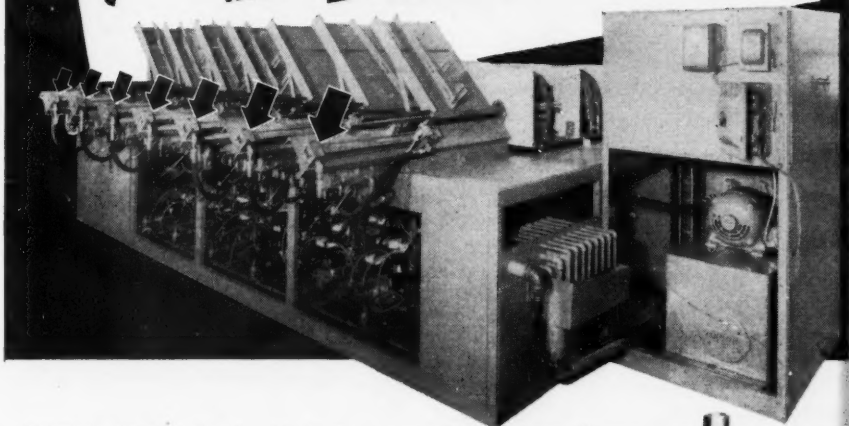
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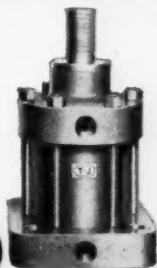
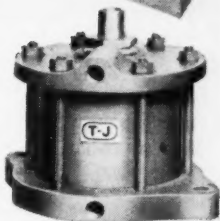
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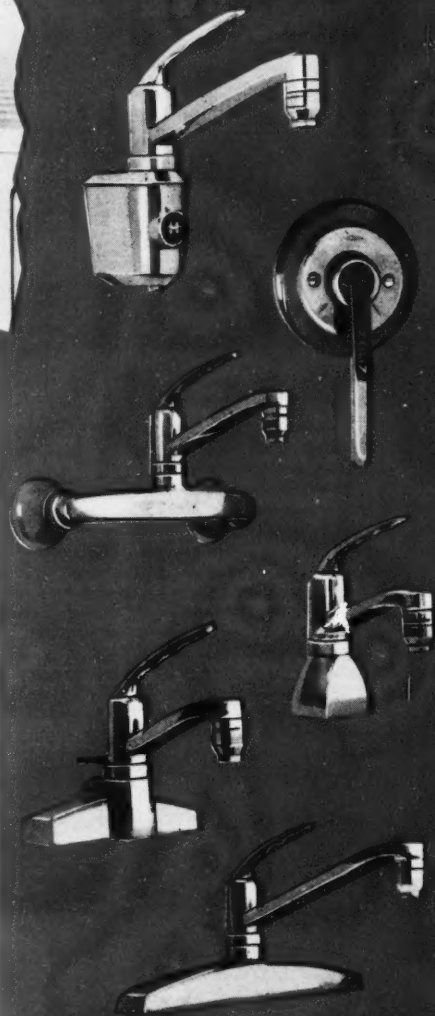
Silver Brazing Single Handle Mixing Faucets

By HOWARD E. JACKSON



WHEN the Ravenna Metal Products Corporation, Seattle, Washington, changed its production methods of manufacturing single handle mixing faucets from sand casting to screw machine methods, management had to decide by which method the parts could be silver brazed together.

The three possibilities considered were furnace brazing, induction heating, and brazing by hand methods. After investigating the capital expenditure required for either of the first two methods, it was found that their costs were prohibitive. Therefore, the com-



(Right) Several types of Moen single handle mixing faucets manufactured by Ravenna Metal Products.

pany had to devise ways and means of brazing by hand, fast enough to meet production needs and meet specifications.

The buying of pre-cut solder was investigated but it was found that the shape of the parts made pre-cutting impractical. The valve piston and cylinder are made of cutlery-type stainless steel, hardened almost file-hard and precision-ground to close clearance. All other working parts are made from wrought brass and stainless steel. Spouts are fabricated from wrought brass. Spout packings and seal rings are neoprene O-rings. Thus, a variety of odd shapes are involved, but these shapes are of material which lends itself to silver brazing.

It was decided to build rotating fixtures so that the parts could be loaded onto them, with a number of preheat stations located throughout the fixtures, and used before the parts arrived at the actual hand brazing operation.

Some 11 fixtures were fabricated in the shop, all removable from their bases. Because of interchangeability only five bases had to be fabricated. Setup time for placing the fixtures onto the bases, connecting gas line

couplings, and so on, is less than five minutes. Total cost of the largest fixture was one hundred dollars.

The largest rotating fixture is provided with fifteen stations: ten are used for preheating, one for soaking after brazing, plus the installation, brazing and removing stations. The smallest fixture is provided with four stations: two preheating, with the brazing being accomplished on the second of the preheat stations, installation and removing stations. The various fixtures, of course, were specifically designed for the different parts in order to hold them in alignment. Preheat stations vary depending upon the masses to be heated before silver brazing.

The largest fixture mentioned above is used for the preheating and silver brazing of hot and cold water tubes to the valve body, and the brazing of a stud to the body (the stud holds the valve escutcheon). A fourth brazing step takes place on the Moen valve body, but only the three mentioned on the Hotpoint body. Moen single handle mixing faucets are sold throughout the country, through plumbing jobbers. They are also standard equipment on Hotpoint dishwasher sinks, with dif-

Fig. 1—View of specially designed rotating type ten-station silver brazing fixture.

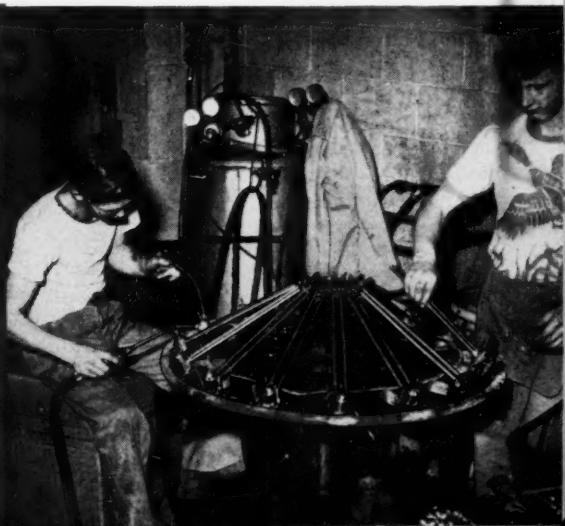




Fig. 2—Oil is removed from parts to be silver brazed by dipping them in a tank containing Trichlorethylene.

kets and lowered into the hot degreasing solution. The parts are then removed and air cooled in the wire baskets, but care is exercised that they are not allowed to stand exposed too long before brazing to prevent contamination by dust, oil or other foreign material which would prevent effective brazing.

Two operators are employed on all silver brazing. One man applies the flux on the ends of the parts to be brazed, places the parts in alignment in the fixture, and, after the second man silver brazes the

ferent external figurations, and are used by many other leading manufacturers.

Other fixtures include: one for brazing the spout body to the spout tube, common to all faucets, with two points of brazing; one for brazing spout ends to spout tubes; one for brazing nipples to the hot and cold tubes on deck models, which, in turn, are brazed to the valve bodies on that large fixture.

The parts to be brazed are carried in trays or pans (most of them being small) from the automatic screw machines to a Phillips degreasing unit. Here they are emptied into wire bas-



Fig. 3 — Illustration showing operator adjusting faucet body to arm of holding fixture after flux has been applied to the portions of the workpiece to be silver brazed.

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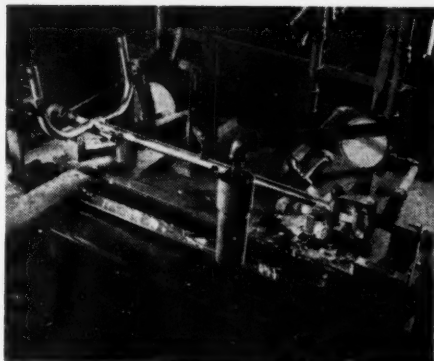
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Fig. 4—View of silver brazing operation.

second man concentrates on silver brazing.

Various types of preheating temperatures were experimented with, and at first Butane gas was used, but the company changed to city gas for reasons of economy. The preheating phase of the

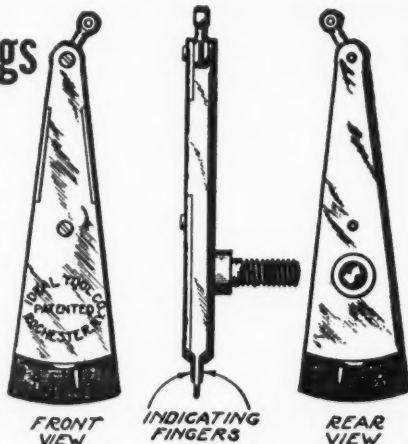
parts, the first man removes the brazed parts from the fixture and places them first in an acid bath to remove the flux, then into water to remove the acid. The

brazing cycle provides for raising the temperature on the part until it is just below the flow point of silver solder, enabling the operator, in just

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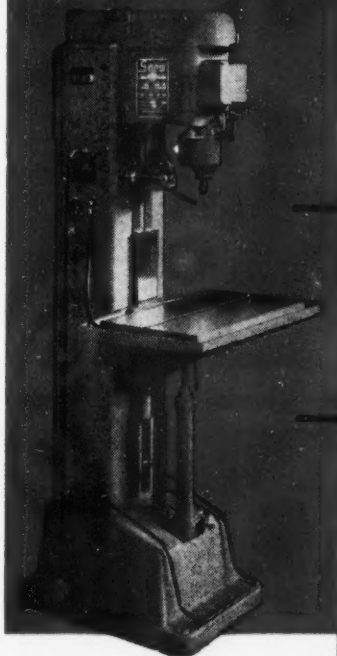


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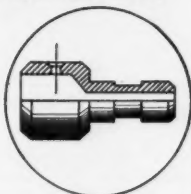
Crossdrill and C" T" Sink 1/16" Hole

Material—Brass

Production—4800 per hour

Fixture—#15 Vertical index

Equipment—#1-UD Drilling Machine



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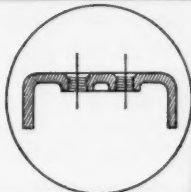
Top Two #10-32 Holes

Material—Steel stamping

Production—3800 tapped holes per hour

Fixture—#14 horizontal index

Equipment—#1-UT tapping machine



THREADING

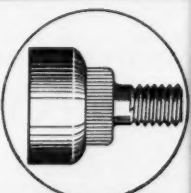
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Material—Die Cast Aluminum

Production—2500 per hour

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Equipment—#3-TR Threading machine



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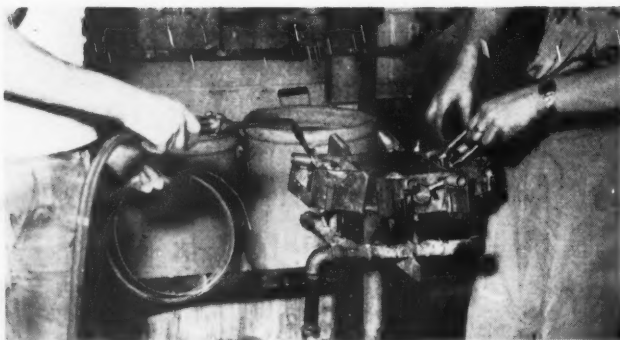


Fig. 5 — Illustration showing smallest silver brazing fixture used in the plant. Two stations of this four - station fixture are for preheating the workpiece and two for brazing.

a few seconds, to raise the temperature of the parts the final few degrees where solder would flow. The operator uses $\frac{1}{8}$ inch diameter coil Easy-Flo 45 silver solder. The time required varies according to the parts but speeds of 600 brazes have been made in one hour (200 assemblies, with three brazes on

each). A Harris automatic torch is used, to raise the solder to flow point.

Such silver brazing has high tensile strength. It was found that a soaking station after brazing improved the operation as it did not permit the parts to cool too rapidly.

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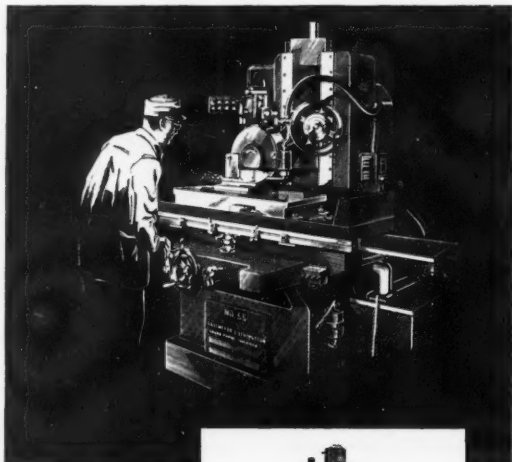
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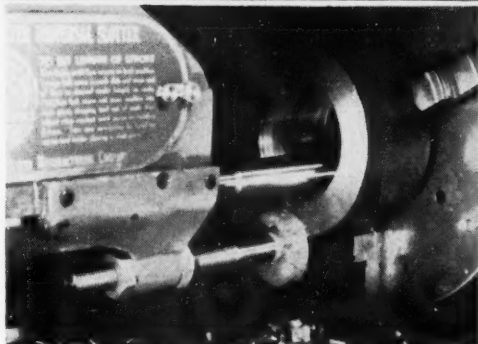
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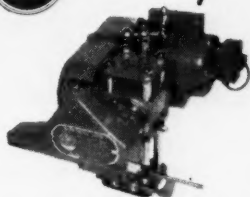
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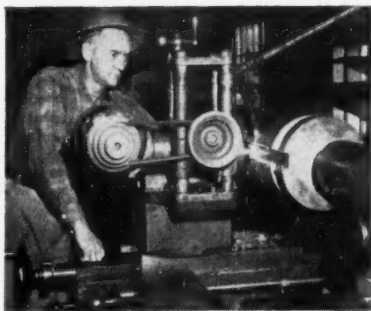
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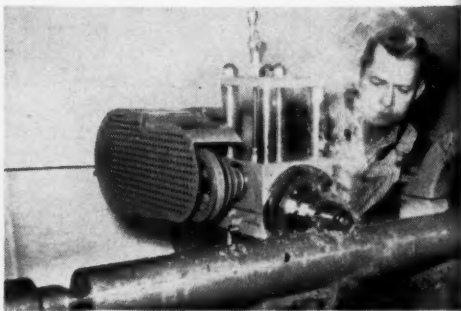
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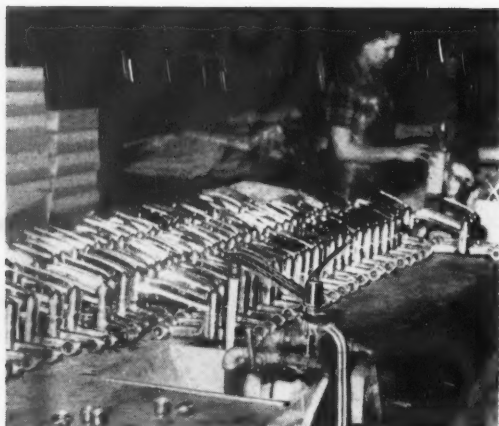


Fig. 6—A Hotpoint faucet is shown in the foreground being "sink" tested.

covered with an escutcheon after assembly. Spouts, which are chrome plated, are routed to the polishing department. They are rough and finish ground on either three shop-made polishing lathes or two Chas. F. L'Hom-

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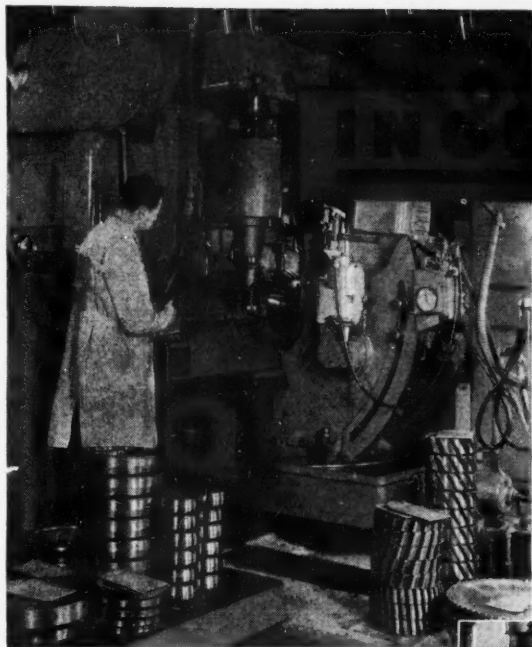
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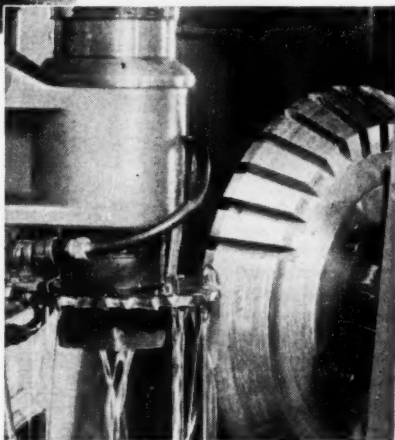
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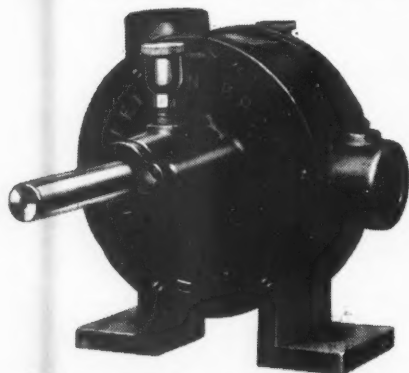


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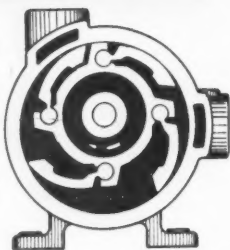
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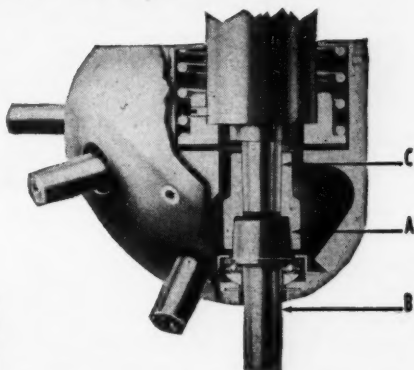
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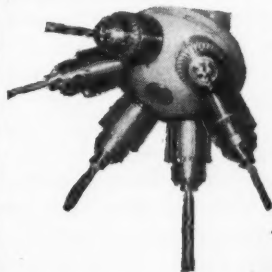


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Broaching

By C. W. HINMAN
Designing Engineer

BROACHING cuts are similar in many respects to those made by shaving in a punch press. The first broaching machines were hand arbor presses designed for broaching keyways through the center holes of pulleys and gear blanks. Shallow broaching cuts are still being made in power driven punch presses, both vertically and horizontally.

About 50 years ago special broaching machines were introduced in order to expand the work which was begun on punch presses. These machines were necessary because of the limited stroke of punch presses, variable speeds of the

ram descent, inconvenient design of presses for broaching long work, and because the down-stroke is usually too fast for broaching. To overcome these difficulties standard broaching ma-

chines are built to accommodate either pull or push cuts in vertical and horizontal machines.

A press slide having 120 strokes per minute and a 1½ in. crank throw has an average travel of 30 feet per minute which is within the limit of many broaching operations.

Presses which operate at higher speeds and with a greater crank throw should be reduced in speed for heavy broaching cuts. Machines designed for broaching ferrous metals usually have a speed range of from 4 to 30 feet per minute, but most jobs are run between 18 to 24 feet. Some non-ferrous metals can be broached up to 80 feet per minute, but in all cases the speed used depends mostly upon the finish desired. The width of cut, as in surface broaching, is also a governing factor.

Broaching dies are particularly useful for enlarging or changing to different shapes, the bored holes in castings and forgings. Internal broaching may also be used for enlarging round holes or to alter their shapes. For example, in the rear gear case for the driving axles

END THE CUT IN THE FACE OF THE TOOTH SO THAT IT BLENDS WITH THE RADIUS



Fig. 2 — Enlarged sketch showing contour of broach tooth.

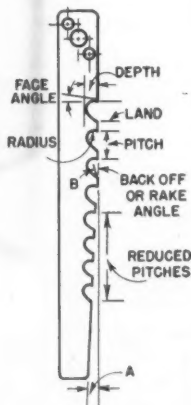
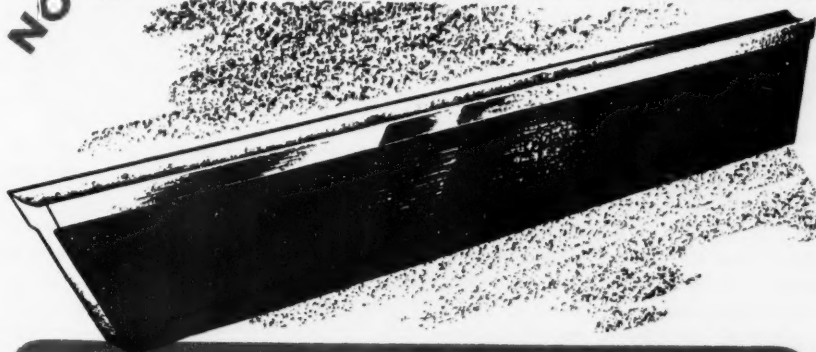


Fig. 1—Sketch showing usual shapes of broaching teeth.

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in an automobile, center holes of the gears, and shaft ends are broached with 8 splined slots. Several keyways may

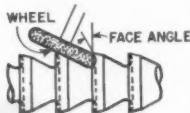


Fig. 3—Sketch showing method of grinding broach teeth.

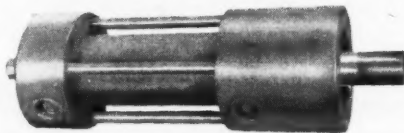
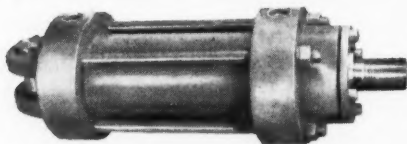
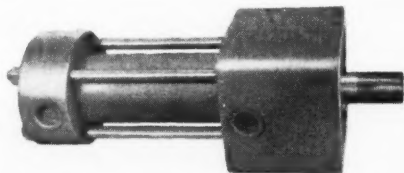
be cut through holes in gear hubs, or in attaching the boss on a crank-arm for heavy machinery.

For broaching either on a punch press or in a specially designed broaching machine, the work must be rigidly clamped in opposition to the cut, and all working members, especially the broaching cutters, must be of sturdy design and construction. If the broaches are of the push variety, they must be well supported and guided in order to resist excessive wear and breakage. Especially should this precaution be fol-

lowed when using cemented carbide inserts for high speed cutting. For broaching in a punch press, the die set should have precision fitted guide posts of substantial diameters, and using a "staggered post" die set mounted in a straight-side press is the best setup.

An analysis of broaching tooth action shows that each tooth acts like the edge of a punch in a shaving die. Each successive tooth cuts a few thousandths of an inch deeper into the work as the broach descends, and the final cut of the last 3 or 4 teeth may remove less than one-half a thousandth of an inch. It is obvious that this condition means fine finishes and close tolerances.

Broaching cuts are governed by the same conditions found in all other machine cutting operations, namely to attain the maximum speed of the cutting



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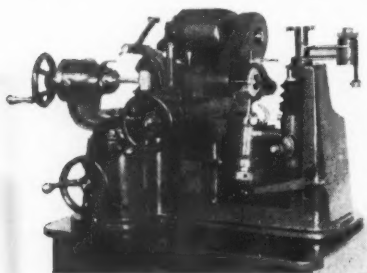
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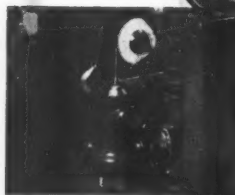
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tool in feet per minute, without its showing excessive wear or failure, the proper disposal of chips, using the best lubricant, the effect of certain tooth shapes on the cut, and the maximum feeding distance into the work that each tooth can safely take.

For certain external cuts, broaching is considerably faster and less expensive than milling. For example, it is a simple matter to broach several straddle cuts in a single operation; the cuts may be on opposite edges of the work and to given dimensions from the ends of long pieces. To mill the same cuts, several operations would be necessary, unless an expensive and complicated fixture is employed.

The usual shapes of broaching teeth are shown enlarged in Fig. 1, and methods for grinding them in Figs. 2 and

3. The pitch is the distance from tooth to tooth, and is determined by the formula $0.35 \sqrt{C}$, in which C is the length of cut. It is usually best to decrease the constant 0.35 to 0.20 when cutting distances less than 1/2 an inch, so that two or more teeth will be cutting at the same time. If the "pull" of three or more teeth exceeds the power of the broaching machine, it is much better to reduce the feed per tooth and thus stay within the capacity of the machine.

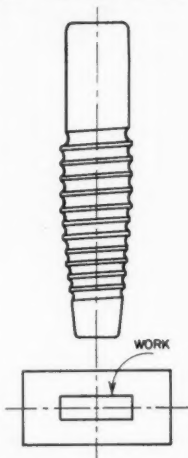
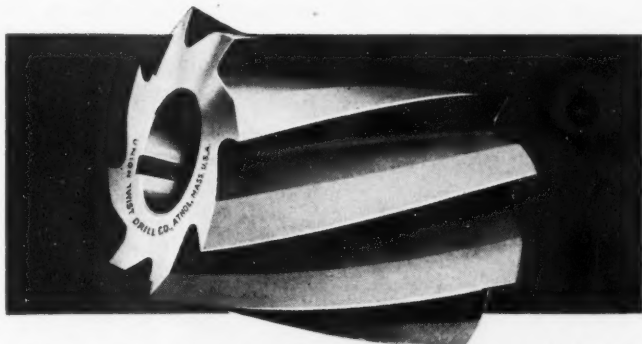


Fig. 4—Sketch showing usual design of broach intended for broaching square or rectangular shaped holes.

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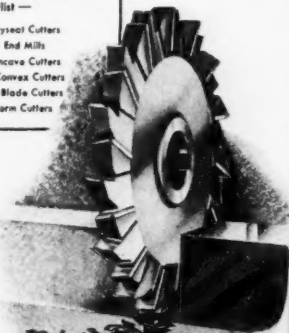
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The "land" should be $\frac{1}{4}$ to $\frac{1}{5}$ of the pitch, and be slightly backed off as indicated by angle **B**, (Fig. 1); this angle can vary from zero to $\frac{1}{4}$ degree. The pitch can be decreased to suit hard or difficult work material, or for abnormally long and wide cuts. The last 3 or 4 teeth at the top are straight in line for finishing the cut accurately. A face angle from 5 to 7 degrees is specified for all the teeth; this design fav-

ors curling the chip and tends to decrease the power to drive the broach.

The feed from tooth to tooth is determined by the cutting resistance of the work material. It depends largely upon the hardness or toughness of the material and the quality of finish desired. The feed per tooth is controlled by the acuteness of angle **A**, and if necessary this angle can be altered easily by grinding, after the broach

has been hardened and tempered.

For broaching square and rectangular holes, the usual design of broaching cutter used is illustrated in Fig. 4. The cutting teeth are slanted across the face of the tool at an angle of about 5 deg. The angular slant of the teeth causes them to produce a shear-cut chip. This cutting feature provides for a smoother finish than straight across teeth give; it also reduces the amount of pressure required to drive the broach. Shearing angles are in opposite directions on opposite sides of the broach, which balances the cut and leads the tool straight.

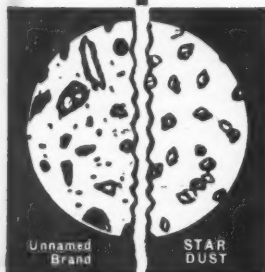
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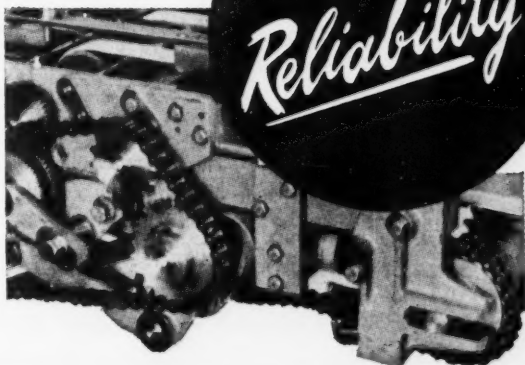
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Fig. 5—Spaces inside the arc of this automatic telephone component have been broached.

Broaching punches of this type are usually pushed clear through the work and die holder and then returned by hand for the next cut.

The variety of shapes that can be broached are limited only by the skill of the designer and toolmaker in producing a tool blank of the proper length, taper, and cross section and in providing it with the most efficient number and shapes of teeth, and last-

ly by the ingenuity of the steel treater. A broach that has warped in hardening can sometimes be straightened while the temper is being drawn.

Broaches are commonly used for round, oval, square, rectangular, regular or irregular polygons, and combinations of these shapes. Keyways, splines, and small internal gears are well-known examples of broaching cuts. Internal helical grooves can be broached by causing the broach to revolve in following the lead of a long spiral. Fortunately, broaching cuts can be easily controlled by the length of the broach, by the depth of the feed per tooth, and finally by the number and shapes of teeth. It is possible to broach a large variety of external contours such as half-hexagonal, Vee shapes and U sections. The contours of millions of small parts for guns have been

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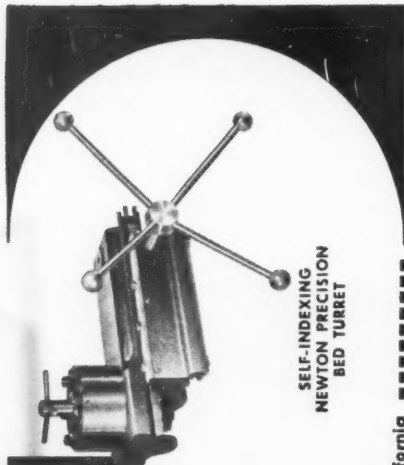
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broached to precision sizes since the advent of defense for war. Surface broaching is also done, such as finishing cylinder blocks and heads.

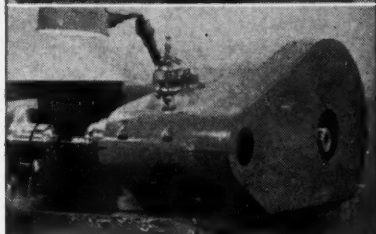
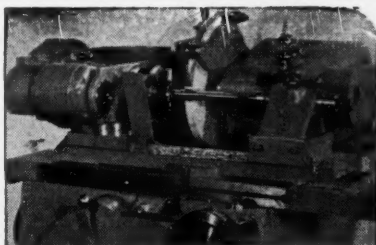
Broaching the rifle grooves in gun barrels, which began in World War I, eliminated the former hooked cutter method, materially reduced machining time and increased the accuracy. Today, broaching is the standard method for rifling gun barrels up to 37 mm. Barrels for larger caliber are rifled with single cutters which are sometimes referred to as broaches and which most broaching tool manufacturers are prepared to furnish.

Broaching Increases Output

Figure 5 illustrates the neat square broached corners of 30 cam toothed spaces and projections in the arc of an automatic telephone impulse component. Formerly this part was blanked in a punch press, one piece per press stroke, but the sharp corners rounded on the flat side, accuracy was sacrificed, and the work was unsatisfactory. By broaching 6 pieces at one time the output was increased tremendously and gave very satisfactory finishes and accuracy.

Editor's Note:

For general information on standard broaching machines and attachments, inquiries may be directed to the following specialists: American Broach & Machine Company, 415 West Huron Street, Ann Arbor, Michigan; Apex Broach Company, Inc., 6401 East Seven Mile Road, Detroit 12, Michigan; Colonial Broach Company, 21601 Hoover Road, Detroit, Michigan; The Connecticut Broach & Machine Company, 21 Pequot Avenue, New London, Connecticut; Detroit Broach Company, Inc., 20201 Sherwood Avenue, Detroit 12, Michigan; Ex-cell-o Corporation, Continental Tool Works Division, 1350 Oakman Boulevard, Detroit 6, Michigan; Illinois Tool Works, 2501 North Keeler Avenue, Chicago 39, Illinois; The Lapointe Machine Tool Company, 34 Tower Street, Hudson, Massachusetts; National Broach & Machine Company, 5600 St. Jean Avenue, Detroit 13, Michigan; U. S. Broach Company, 6463 East Seven Mile Road, Detroit 12, Michigan; Headquarters of Broaching Tool Institute, 74 Trinity Place, New York 6, N. Y.



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O. H. Wismer of Electrical Mechanical Development Company, Los Angeles, exhibits a pair of inexpensive stamping dies (left and center) which have been used in the fabrication of the sheet metal prototype shown at the right.

THE need for prototypes prior to the actual manufacture of a new product frequently leads to a number of serious

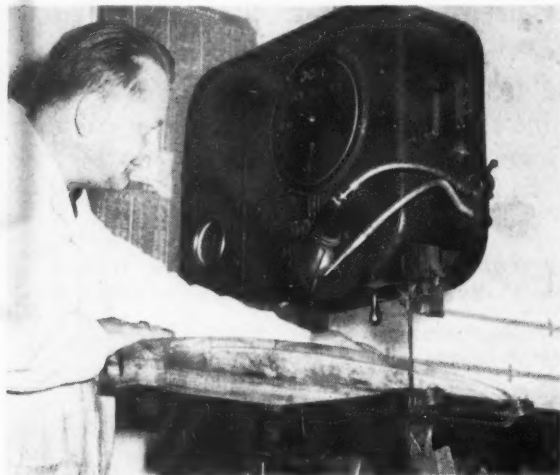
Inexpensive Prototype Tooling

In which the author describes a method of determining in advance the practicability of a new product design.

By FRANK CHARITY

tooling problems because it is impractical to spend large sums of money on molds, dies, and so on, which may be scrapped after they have been used one or two times; and, also, because there is generally no point in constructing a prototype if the latter cannot be as good in every respect as its possible production replicas.

Many ingenious methods have been evolved to lower the cost of prototype tooling, particularly in the aircraft industry; but, as yet, expenditures for prototypes represent some of

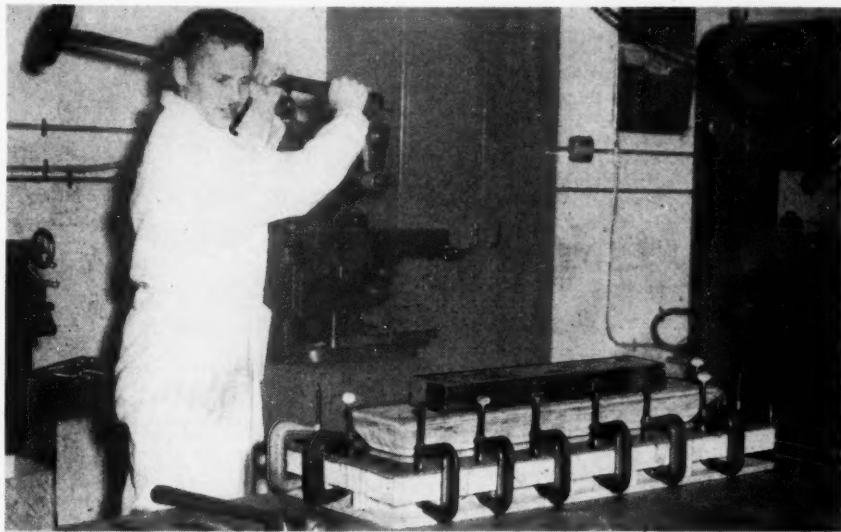


A power saw is used to trim a wood die which will be used in the fabrication of a sheet-metal prototype at Electrical Mechanical Development Company, Los Angeles.

the largest and most speculative investments that can be made by manufacturers of metal products.

However, O. H. Wismer of Electrical Mechanical Development Company at Los Angeles has recently provided an astonishing assortment of evidence to

The wood dies were made directly without special patterns by shaping, planing, sawing, turning, and otherwise fabricating both hard and soft wood materials to produce suitable parts. Then the parts were assembled as male and female units by coating



A sledgehammer is used to facilitate the drawing of a prototype component with inexpensive wood dies at Electrical Mechanical Development Company, Los Angeles. C-clamps hold alloy sheet stock over the female die cavity, and a steel bar is positioned on the overhead male die to prevent splintering of the wood.

prove that a manufacturer does not necessarily have to court bankruptcy in order to determine the quality of a new-product design before the latter can be used in actual production work.

For example, when it was recently necessary to construct the prototype for a new-type washing machine, Wismer worked out an unusual method of fabricating wood dies for use in place of cast-alloy stamping dies and consequently reduced the estimated \$45,000 cost of the prototype to an actual cost of about \$4000.

each with a high-strength phenolic resin adhesive and by using nails to apply pressure (while maintaining the alignment of the adhesive-coated components) until the resin had created high-strength bonds by "cold curing" at room temperature.

Die assemblies were finished by sanding (to assure smooth surfaces and critical dimensions), and by shielding the surfaces with a fast-drying lacquer coating—over which a heavy-grease lubricant was later applied in order to reduce the effects of friction where



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Steel Type

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deep draws were required.

This procedure made it possible to acquire mated dies in a period of slightly more than 24 hours (whereas the least-expensive cast-alloy dies could not have been readied for use in less than two weeks); and experience subsequently proved that each of the mated-



The two steel discs in the lower foreground of this illustration served as inexpensive die components for drawing and producing bas-relief numerals on the clock housing, which is shown in the center. The dies were primarily developed for the fabrication of prototype housings only, but they turned out to be suitable for production work. They were developed by O. H. Wismer of Electrical Mechanical Development Company, Los Angeles.

die sets could produce as many as six identical prototype parts without a loss of essential details.

Use of the wood dies consisted of clamping sheared-sheet stock over each female cavity and forcing the stock to conform with the configurations of the cavity, as indicated in accompanying illustrations, by applying pressure via a male die unit. Press equipment was required for some of the forming operations; but, in most cases, the work was done by placing a heavy metal bar on the male die (to prevent splintering of the wood in the die) and by manually using a sledgehammer to strike the bar so as to force the die and sheet stock into the female cavity.

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**• A NEW MACHINING METHOD!
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ROTARY BROACHING *
- A NEW NAME-"ROTARY BROACH" *

ROTARY BROACHES may be used in lathes, turret lathes, automatics, drill presses, etc., to replace reamers. They produce perfect holes with finishes that can only be compared to honing. They last longer before grinding is necessary and may be resharpened 10 to 30 times. They produce perfect holes at a fraction of the cost of those produced by other methods. Eliminates grinding, lapping, honing and boring.

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SHEARCUT TOOL COMPANY

BOX 746, DEPT. MM-11

RESEDA, CALIFORNIA

November, 1951

MODERN MACHINE SHOP 233



Compressor blades on the spun-metal prototype shown here were accurately and economically made with the male and female dies, which respectively appear in the lower left and right corners of the illustration, at Electrical Mechanical Development Company of Los Angeles.

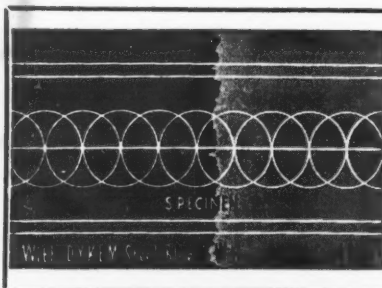
Incidentally, Wismer's company is now making extensive use of wood tooling to lower the cost of fabricating prototype metal parts for the automotive and aircraft industries. However, other types of special prototype tooling have been developed by Wismer for unusual applications.

For instance, where it was necessary to deep-draw sheet stock to make housings with bas-relief numerals for clocks, he evolved the following technique for

Engineering changes, as specified by prototype tests, were incorporated on the wood dies by machining or adding new parts to the latter. Then, when all details of the design were perfected, the wood dies were used as patterns in the fabrication of permanent metal dies for the production forming of sheet metal washing machine parts, thus reducing the cost of the latter tooling by another substantial margin.

fabricating low-cost tools which can be used for both prototype and permanent production purposes:

- (1) Two steel plates were routed to produce discs with the desired inside diameter and shape of the face of the clock housing.
- (2) Numerals were scribed, as required by the housings, on one of the discs.
- (3) The latter disc was routed in-



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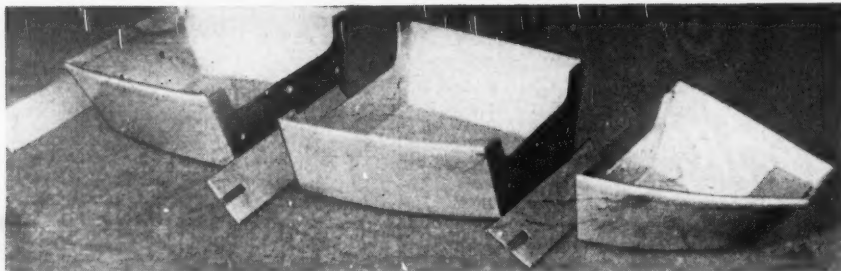
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This prototype version of a rowboat (which can be disassembled for transportation in the luggage compartment of an automobile) was made from aluminum-alloy sheet stock at a reasonably low cost by Electrical Mechanical Development Company, Los Angeles.

ternally along the lines of the numerals scribed thereon.

(4) Materials routed from the scribed disc (or female unit) were manually riveted to one side of the mating disc, during which procedure the two discs were clamped together so that the female die could serve as a pattern for

the precise assembly of the numerals on its mate.

(5) The two discs were center-drilled and mounted on appropriate bases for press-drawing operations.

A more difficult problem was encountered when it was necessary to form circumferential compressor

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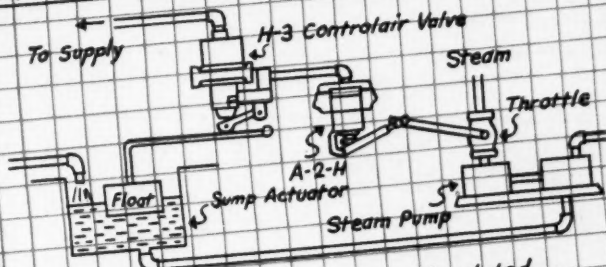


Ideas for
Engineers

Data Sheet

#5

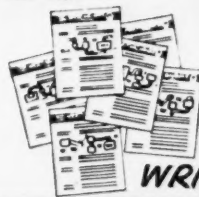
EQUIPMENT: Cooling Water Sump Control



APPLICATION: To proportion flow of recirculated cooling water to processing load

SOLUTION: Westinghouse H-3 Control Air linked to float in sump. Movement of float varies delivered air pressure from valve to Westinghouse A-2-H Actuator, which positions itself accordingly, adjusting steam pump throttle

RESULT: Elimination of manual control - adequate cooling water under all rates of plant operation



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blades in spun aluminum alloy discs (one of which is also shown in an accompanying illustration). But here again Wismer found a way to get the job done at a surprisingly-low cost by fabricating tools as follows:

(1) A tool-steel cutter with the inner dimensions and shape of each blade was machine fabricated in a conventional manner.

(2) The cutter was mounted on a

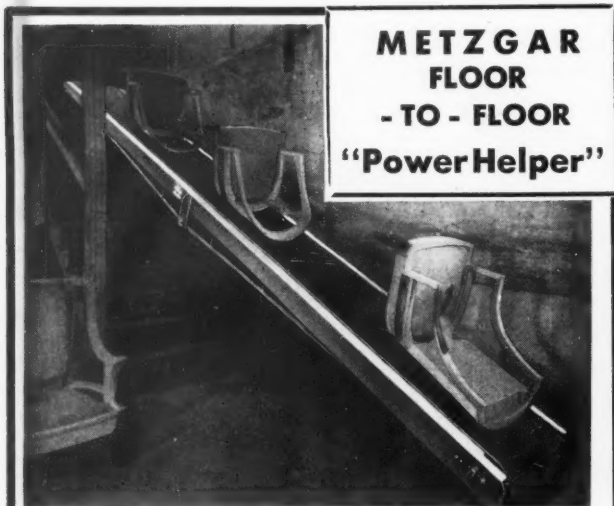
suitable metal base which had dowels for locational purposes, so that the assembly could be used as a male die for cutting and forming each of the required blades.

(3) The male die was shielded with a refractory coating which had the thickness of the aluminum-alloy materials to be fabricated therewith.

(4) The refractory-coated die was used as a pattern on which a mating female could be cast.

"The only completely - satisfactory solution to any prototype or, for that matter, production problem," Wismer maintains, "is to get the job done at a cost of absolutely nothing. But that, of course, is a solution that nobody is likely to find in any industrial organization.

"However, most manufacturers have found satisfactory solutions to their production problems; and I think most companies can achieve the same results with reference to prototype problems, when and if it is realized that the fabrication of prototypes represents



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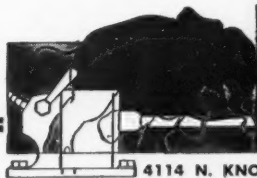
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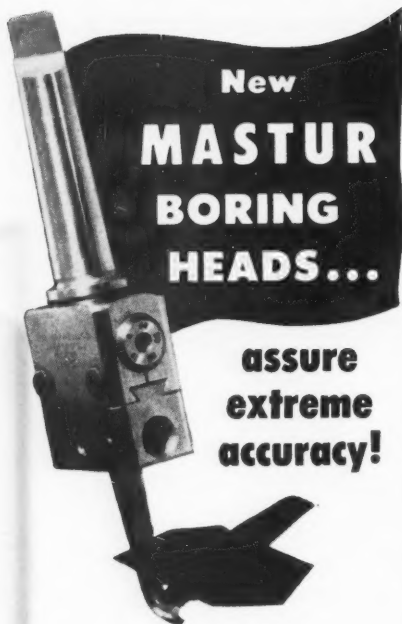
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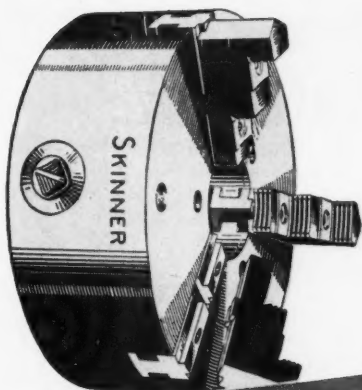
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sents an engineering specialty—not the sort of work that should be undertaken by men who are fundamentally interested in production techniques.

"In other words, I believe my work is remarkable only to the extent that a lot of other men haven't been doing the same thing for years."

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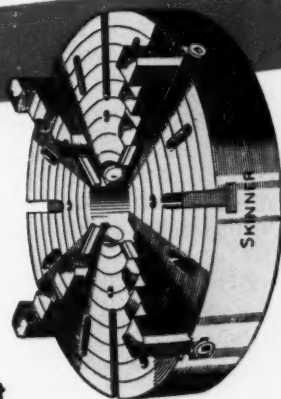
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Little Chats On Practical Psychology

No. 7—Some Supervisors Are “Yes-Men” Too.

MOST of us are familiar with the supervisor who operates on the basis of the “kiss-off” technique. He is always very glad to see you, always friendly, always is giving your ideas or your requests every consideration, but never doing anything about it. Maybe by next week he'll be able to do something — he'll have to give your request further thought.

While he is doing this, he picks your brains on everything from new methods to kinks about the machines and details of all types about workers, housekeeping, safety, and production. Whenever one of these ideas turns up in his department, he is always the proud father of the little “brain-child”. He gets all he can out of you and gives little or nothing in return.

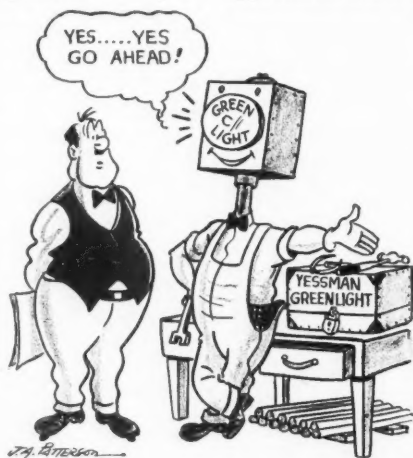
Handle this man the way you would a professional and confirmed procrastinator, only more so. First, put him over

a barrel by telling him you appreciate his friendly spirit and cooperative attitude. Not many people are so willing to take time to listen to your ideas or let you explain the reasons for your requests for help. Tell him you know he appreciates the true value of the information

you have been giving him. Say that there are a lot of people (not he, of course) who show a friendly spirit and then never get around to doing anything. Really capable people, such as he is, show the same friendly attitude and then come across in the clutch. Put him in the position where he has to

come through for you or admit publicly what a louse he really is.

The Chinese were famous for “saving face”, and many psychologists agree that it is usually well, when dealing with difficult personalities, to give them an opportunity to “save face” gracefully. In this case, you let the



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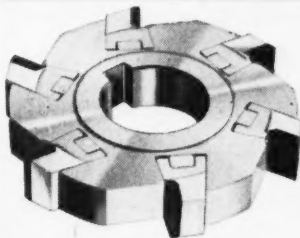
COUNTER BORE



Taper Shank
Core Drill



Taper Shank
Reamer



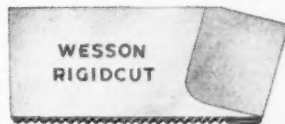
Varicut—Milling Cutter



"Rigidcut" Face Mill
Uses Solid Carbide
or Carbide Tipped Blades



Fine Pitch Blade



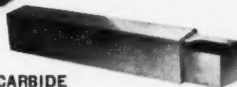
Coarse Pitch Blade



"Multicut" Tool Holders
9 TYPES, 90 SIZES—



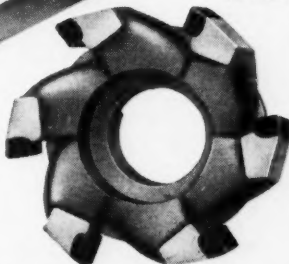
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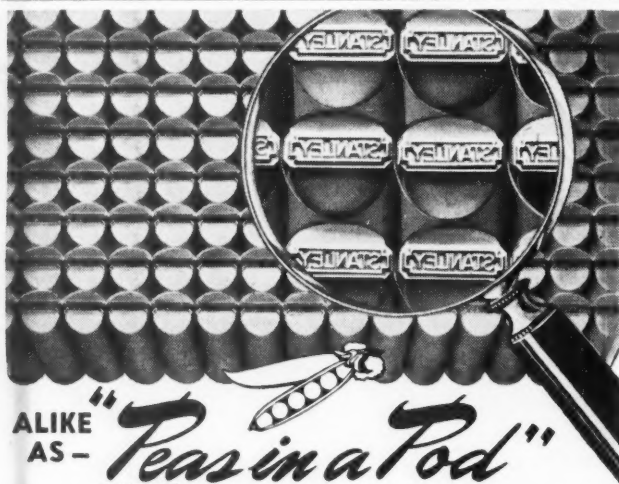
"yes-man" save face gracefully in only one way—by cooperating with you right down the line.

Sometimes you run into the man who simply would rather be agreeable than disagreeable, who has no intention of doing anything positive, but just doesn't have enough courage to come right out and say so. Instead, they give you

the impression that they will cooperate, that they are sympathetic to your opinions, and tell you they'll have to think it over carefully.

The answer to this sort of thing is to do what salesmen do—"qualify" the man early in your discussion with him. Dig into his interests and his personality and find out if he has any real interest in what you

are saying, or is just trying to be "nice" to you and get rid of you as easily as possible. Be a little blunt in a polite way. Explain that you know his time is valuable, and you also place a high value on your own. You won't get your feelings hurt by what he might reply, but you want his frank statement on the subject at hand. Time saved by this method can usually be well spent getting real cooperation elsewhere in solving your departmental problem.



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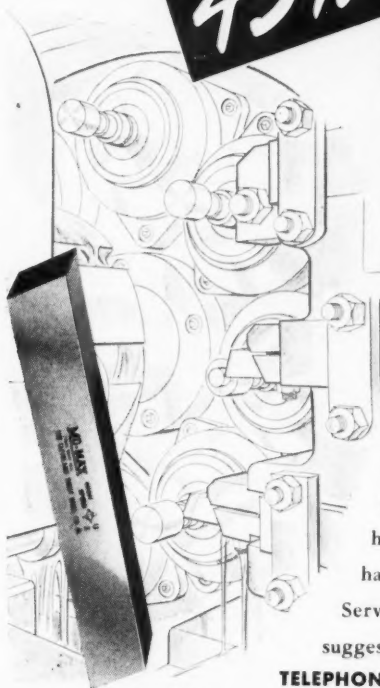
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On three operations in the set-up pictured here—machining nickel-moly steel (4615) at 135 to 150 s.f.m.—the superintendent kept careful records of tool performance. It was found that MO-MAX COBALT High Speed Ground Tool Bits ran 43% to 100% longer than the tool bits previously used. ♦ In the break-down operation MO-MAX ran 4 hours, as compared with 2 hours for the other steel. In facing, it was 5 hours against 3½ hours. In cut-off, 4 against 2½. ♦ This is one of hundreds of tests in which both MO-MAX and MO-MAX COBALT Tool Bits have demonstrated their superiority. So if you have a difficult machining problem, a *Cleveland* Service Representative will be glad to give helpful suggestions. Contact our nearest Stockroom, or . . .

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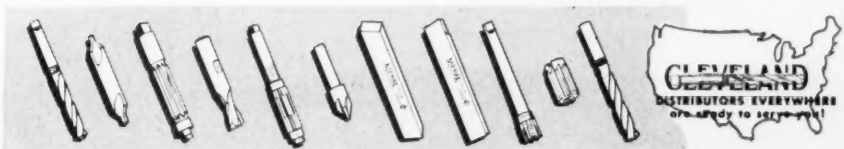


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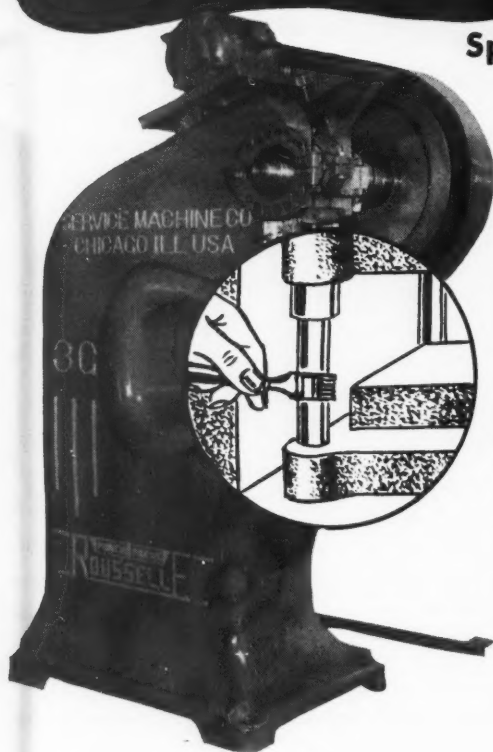
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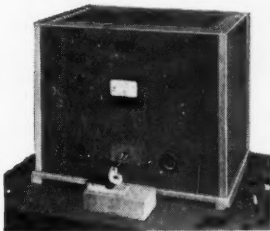
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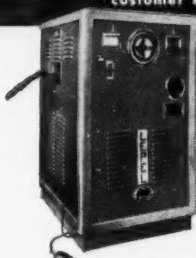
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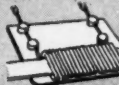


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WRITE FOR LEPEL CATALOG MMS-11.



MODERN EQUIPMENT AT WORK

Waves and Bends Re- moved from Copper and Brass Tubing with Rotary Straightener

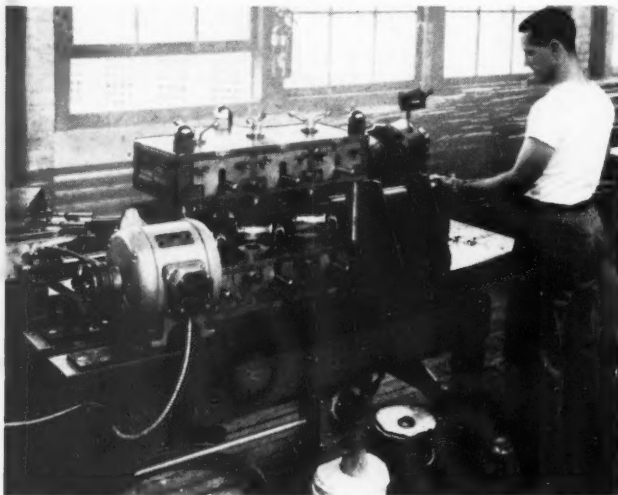
THE accompanying illustration shows a cross-rolled rotary straightener installed in the finishing department of Small Tube Products, Inc., Waterbury, Conn., for straightening copper and brass tubing. Operating at the rate of 550 feet of tubing per minute, the machine, which is a product

of the Mackintosh-Hemphill Co., Pittsburgh, Pa., removes waves and bends from approximately 1,000 pieces of 20-foot tubing per hour.

Tubing straightened on the machine varies in diameter from $\frac{1}{4}$ to 1 inch, in wall thickness from 0.010 to 0.083 inch, and in length from 6 to 24 feet. Despite these variances and their resultant frequent change in machine setup, the rotary unit enables the plant to meet straightness requirements considerably more rigid than was possible

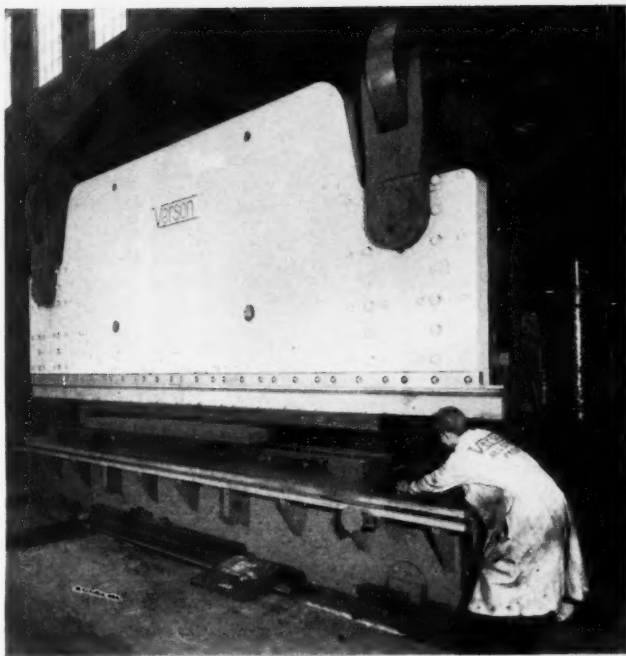
with the straightening equipment previously used.

An interesting feature of the setup illustrated is the powered cot-



Rotary straightener in the finishing department of Small Tube Products, Incorporated, removes waves and bends from copper and brass tubing at the rate of approximately 1,000 pieces of 20-foot tubing per hour.

Fig. 1 — Electronic control of the ram motion is featured on this 1,000-ton press brake manufactured by Verson Allsteel Press Company of Chicago. The General Electric device permits the ram to be operated at a preselected tilt or to be held completely level throughout its stroke.



ton buff shown to the left of the straightener. To cut the lubricant used in drawing tubing, the machine operator applies a solvent to the tubing, this solvent, in itself, being a lubricant for the tubing as it passes between the rolls of the tube clean and thereby eliminate the need for manual cleaning of the finished product before packing for shipment.

Photoelectric Device Used to Control Ram Motion of Press Brake

WHAT is believed to be the first press brake ever to utilize photoelectric control of the "ram" motion has been constructed by the Verson Allsteel Press Company of Chicago. Through the use of the General Electric electronic system, the ram may be held completely level through its stroke or may be operated at a preselected

degree of tilt down to a thousandth of an inch.

The new press is hydraulically operated. The ram is actuated by two independent hydraulic cylinders supplied from separate matched pumps. A reversible booster hydraulic pump is used to transfer oil from one line to another to maintain position synchronization of the ends of the ram. The booster pump is driven by a motor supplied by an amplidyne generator, which is controlled by the photoelectric system. Any tilt of the ram raises or lowers a barrier suspended between the photoelectric cell and the light source. Movement of this barrier as much as a thousandth of an inch results in automatic correction through altered speed and direction of the oil flow from the transfer pump. Vertical micrometer adjust-

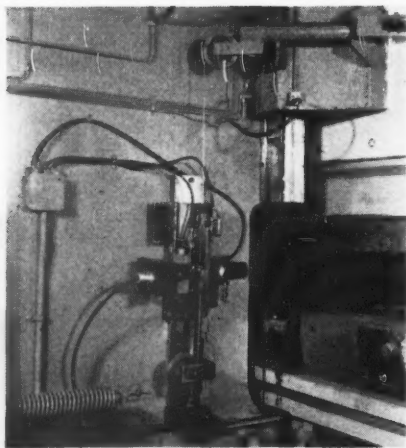


Fig. 2—Close-up view of photoelectric device used to control the ram movement of the press brake shown in Fig. 1.

ment of the electronic unit permits the ram to be operated at a selected degree of tilt when required.

Pressure Booster Increases Efficiency of Milling Machine Clamping Fixture

A CLAMPING fixture built by Planet Products Corp., Cincinnati, Ohio, and used on the Sundstrand "Rigidmil" milling machine incorporates a standard Miller B4 "Air Miser" fluid pressure booster with a booster ratio of 25 to 1, driving a standard Miller high pressure (2,000-3,500 p.s.i.) hydraulic cylinder. Product of the Miller Motor Co., Chicago 18, Ill., the booster and cylinder are assembled integrally as a compact unit with no high pressure piping between. Adjacently mounted oil tanks provide the volume requirements of the low pressure approach stroke of the clamping fixture.

Operation of the fixture is effected by ordinary plant air and, at 80 p.s.i.

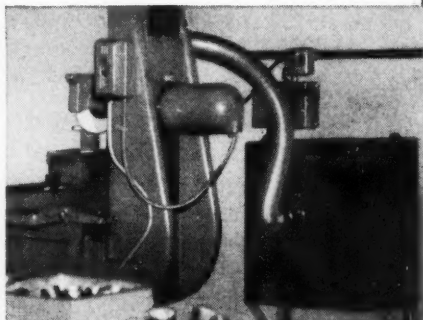
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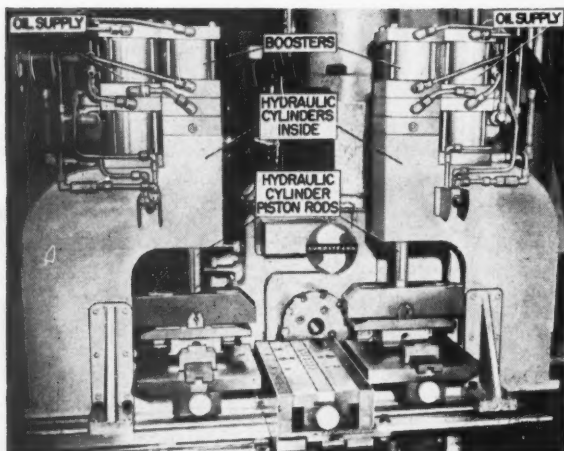
Whether your transmission problem involves a single or double plate or multiple-disc clutch, a power take-off or a speed reducer, the ROCKFORD engineering staff will contribute over a quarter century of successful clutch application experience toward its practical solution. Thousands of design engineers have utilized this help to fit maximum torque

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BORG-WARNER
300 Catherine St., Rockford, Illinois

ROCKFORD CLUTCHES



Milling machine clamping fixture setup utilizes fluid pressure boosters to provide high clamping pressures for holding workpieces firmly during milling operations.

higher or lower hydraulic clamping pressures are obtained automatically.

A flick of a switch causes the plant air to flow into the oil tank, driving the oil through the booster by-pass and directly into the hydraulic cylinder so that its piston rod extends with low pressure to contact the work. As soon as the rod contacts the work, the high pressure air from the booster "cuts in" automatically to pro-

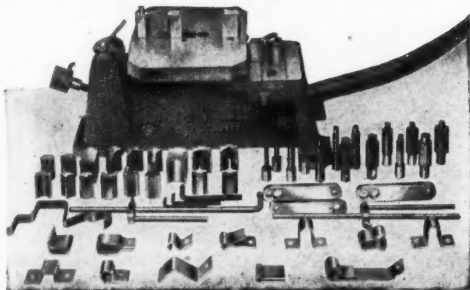
vide a total clamping pressure of 2,000 p.s.i. for a 2½-inch bore high pressure hydraulic cylinder is obtained to provide a total clamping force of 10,000 lb. By varying the air pressure input,

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BOOTH H-154 NATIONAL METAL SHOW

NEW

HEAVY DUTY DIAL FEED



4, 6, 9, 12, 18 or
36 positions

22" Diameter
Table Top

4, 6, 9, 12, 18 or
36 positions

★
Positions up to 1000 lbs.
quickly and accurately

★
Positive locking

★
Can be mounted in
any position

Bellows Model BRET-22 Rotary Feed Table is an electrically controlled, air-powered unit for dial feeding work pieces to drilling machines, tappers, reamers, press rams, etc.

Powered by a $3\frac{3}{8}$ " bore Bellows Air Motor, the standard 22" diameter table top will position loads of 1000 lbs., quickly and accurately.

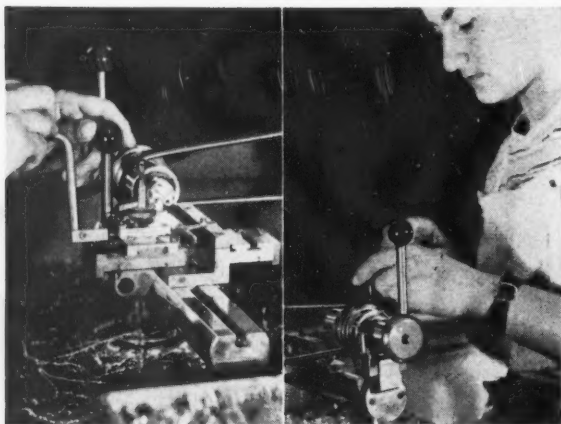
At each station the table top comes to a stop gently, without abrupt impact, and is locked into position by a $1\frac{1}{4}$ " bore air cylinder. Model BRET-22 is easily synchronized electrically to other machine operations.

The 22" diameter mild steel table top is easily removed for mounting jigs, fixtures, or oversize table top. Standard models can be set to position 4, 6, 9, 12, 18 or 36 positions.

Write for Bulletin T-85 Today! Address: The Bellows Co., Dept. MMS-1151, Akron 9, Ohio

The Bellows Co.

AKRON 9, OHIO



(Left) Profiling the stem of an oxygen regulator valve in a jeweler's lathe. (Right) jeweler's lathe set up for recessing.

vide the high clamping pressure required for holding the work firmly during the milling operation.

Jeweler's Lathe Provides for Economy in Precision Operations

MAKING use of a precision jeweler's lathe as manufactured by Louis Levin & Son, Los Angeles 21, Calif., the R. A. Hawks Mfg. Co., Sierra Madre, Calif., has increased production 50 per cent in the machining of precision exhalation valves for high altitude oxygen masks. After being blanked on an automatic screw machine, the pieces are re-

ing several times the precision lathe now being employed. The work which used to require the services of an experienced machinist, is now handled efficiently by a woman operator at twice the speed.

Machine Taps 47 Holes in 20 Cylinder Blocks per Hour

A TWO-WAY horizontal hole tapping machine capable of tapping 47 holes in 20 automotive cylinder blocks per hour has been developed by the National Automatic Tool Co., Richmond, Ind. All operations are au-

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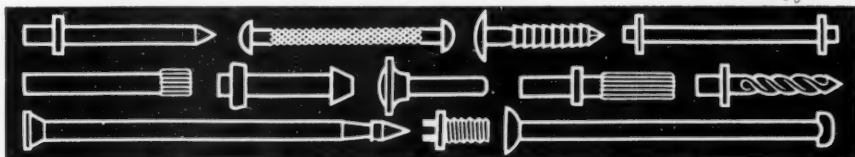
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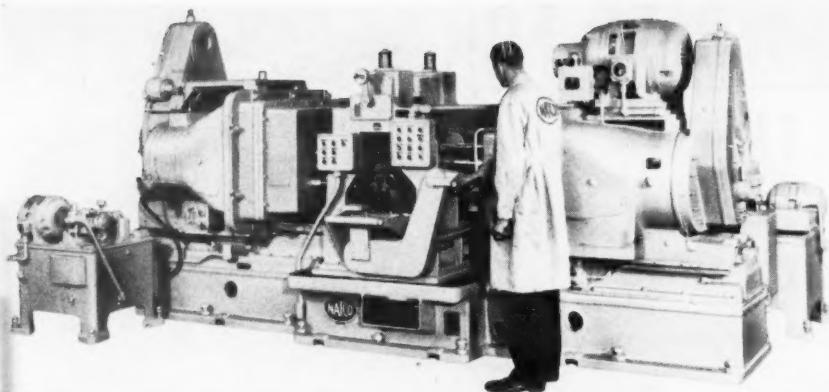


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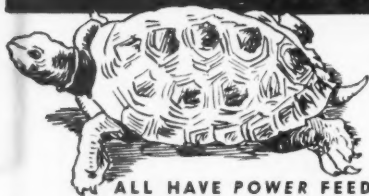
This special two-way horizontal hole tapping machine is designed to tap 47 holes in a cylinder block at the rate of 20 blocks per hour.

tomatic, as follows: (left-hand head) taps 11 holes to $\frac{1}{4}$ -inch pipe tap, taps 4 holes to $\frac{1}{2}$ -inch pipe tap, taps two holes to $\frac{3}{8}$ -inch pipe tap, taps five holes to $\frac{1}{2}$ -inch-16 tap, and taps one hole to $\frac{1}{2}$ -inch N.P.T.; (right-hand head) taps

13 holes to $\frac{1}{4}$ -inch-14 tap, taps six holes to $\frac{1}{4}$ -inch pipe tap, taps four holes to $\frac{1}{2}$ -inch-13 tap, and taps one hole to $\frac{1}{2}$ -inch pipe tap. The rate of production is said to be approximately 20 parts per hour.

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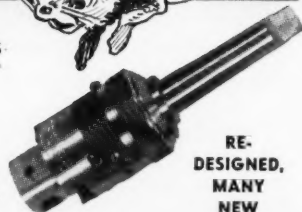
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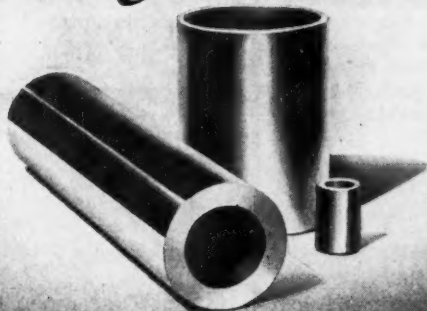
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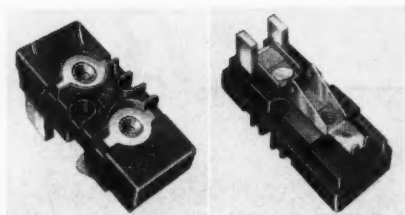
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Manufacturer of Automatic Controls Cuts Production Costs with Multipress

A FOUR-TON Multipress with a six-station indexing table is said to be saving \$7,345.00 each year in scrap loss, doubling the output, and combining the production of two types of switches at the Penn Electric Switch Co., Goshen, Indiana.



This illustration shows a top and bottom view of a six-part magnetic switch assembly which has been staked together with a single ram stroke of a four-ton Multipress equipped with a six-station index table, automatic control, and dual punch mounted in a beeswax-filled head.

In the operation, the Multipress, which is a product of the Denison Engineering Co., Columbus, Ohio, stakes five metal parts into a bakelite base with each ram stroke. Since the adoption of the Multipress, production, it is claimed, has increased to twice the former rate without additional labor time, and scrap losses have been reduced more than 80 per cent. Moreover, operators at the Penn Electric Switch Company are said to prefer the Multipress because of its much quieter, safer, and smoother action, which makes it easier to operate than the previous press equipment. The operator's job is simply to place the magnetic switch parts in the holding fixtures at each of the six stations.

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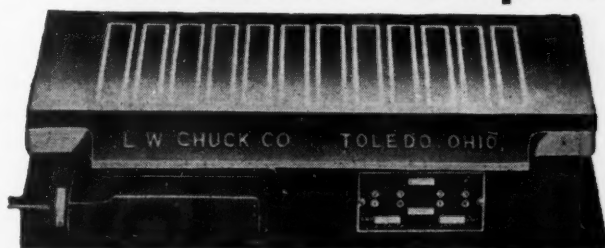
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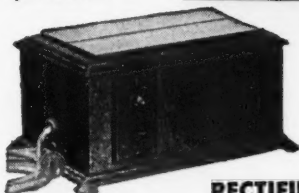
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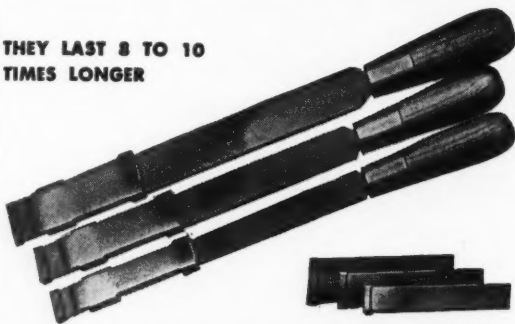
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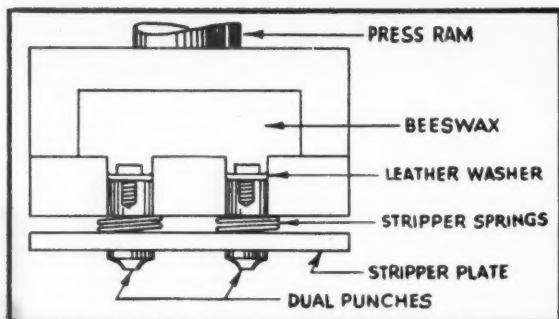
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Detailed sketch of tooling used on Multipress to stake metal parts into bakelite switch bases.

drive spurs mounted on the face of each spindle while the magazine slides retract and reload. The toolslide, mounting quick-change tools, rapidly advances downward to position and feeds horizontally

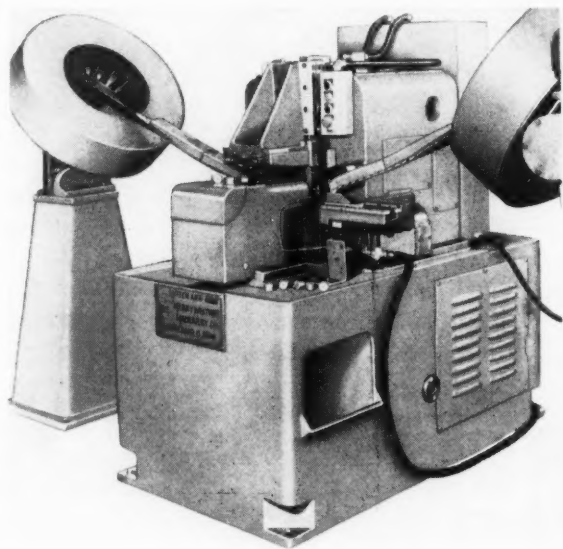
across the diameter of the work. The toolslide is then withdrawn rapidly to dwell position where the second tool chamfers the trailing edge of the piece. The cam actuated loading mandrels are then withdrawn from the workpieces, allowing them to fall into take-off chutes which convey them by gravity to a tote box. Two more workpieces are then brought into loading position by the magazine slides as the cycle is completed and repeats.

fixtures by a cam track inside the table housing, and an air ejector blows them into a chute that carries them on to the next operation.

Cam Automatic Turns Electric Motor Rotors

THE accompanying illustration shows a setup for turning the outside diameter and chamfering one end of laminated silicon steel rotors of small electric motors. Varied lengths of any one diameter can be handled with this setup, which comprises a new two-spindle cam automatic produced by The Motch & Merryweather Co., Cleveland 13, Ohio.

The machine cycle is as follows: Cam-actuated loading mandrels automatically locate in the center hole of each piece and force the piece against the hardened

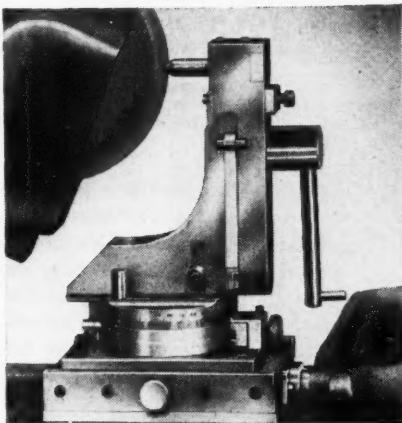


The outside diameter and one end of laminated silicon steel motor rotors are turned and chamfered respectively at the rate of 800 pieces per hour with this equipment.

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ed onto its outer end. Two ball-ended handles, **J**, are screwed into the special nut to be used as turning aids. A tension spring, **K**, is positioned on the eye bolt shaft between the upper surface of the tongue and the lower surface of the base projection.

A locating block, **L**, is positioned in a hole in the right side of the tongue. The block is machined to a vee shape on its under surface, as shown, for location of the connecting rod protrusion; and it is held in place in the tongue by means of a headless set screw, **M**. Directly beneath locating block **L** and placed in a hole in a base projection, another locating block, **N**, is positioned. Block **N** is also machined to a vee on its locating surface, and it is held in place by means of a headless set screw, **O**.

Two capscrews are used for the partial positioning of the small end of the connecting rod. These capscrews are positioned as shown, one, **P**, horizontally through the vertical section of the base, and one, vertically through

a base projection. The capscrews are held in place by means of hex nuts, **R**. A third positioning part is a tool steel, hardened locating pin, **S**, which is driven into a horizontal base projection.

A clamping mechanism is provided at the left side of the base. A steel stud, **T**, is threaded into a tapped hole in the base; and a steel strap, **U**, is positioned on the end of this stud. A tension spring, **V**, is held on the stud

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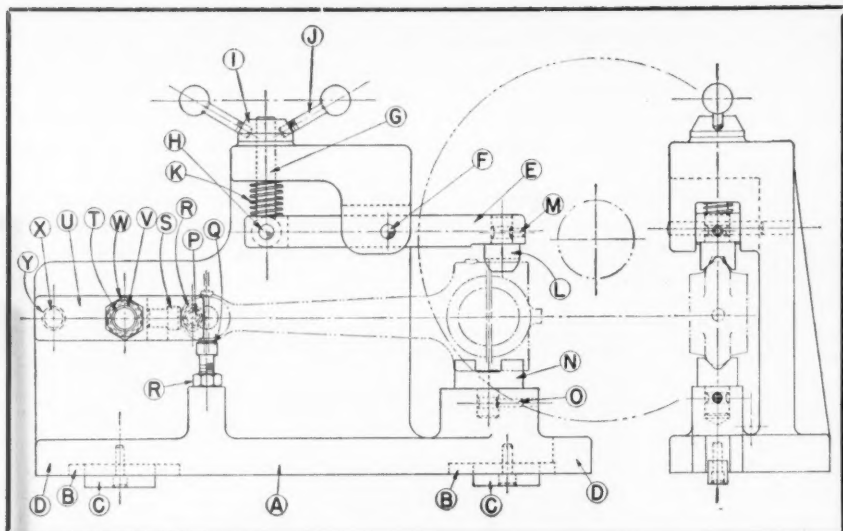


Fig. 2—Views showing various details of a fixture designed to be used when straddle milling the faces at the large end of the connecting rod shown in Fig. 1

between the inside vertical wall of the base and the strap; and the strap is held in position by means of a hex nut, **W**, on the end of the stud. A tool steel, hardened pin, **X**, which is pressed into the base, is also used to maintain the strap at the proper distance out from the vertical wall of the base. A 150-degree conical indentation is machined in the strap, as shown at **Y**, to provide for positive positioning and to allow for

a slight amount of pivoting when the nut **W** is unscrewed.

To use the milling fixture, the two side milling cutters are first set up on the machine arbor at the proper distance apart in order to machine both faces of the connecting rod. The fixture is then placed on the machine table and positioned; the two keys, **C**, are fitted into the table slot, and the nuts are tightened on the two T-bolts



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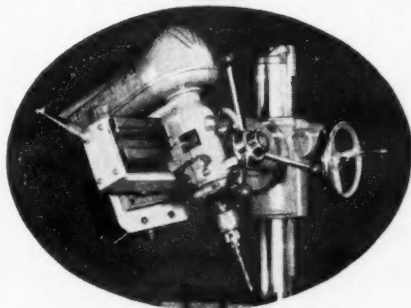
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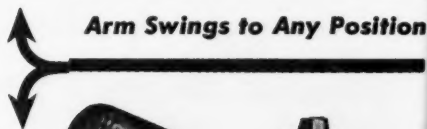
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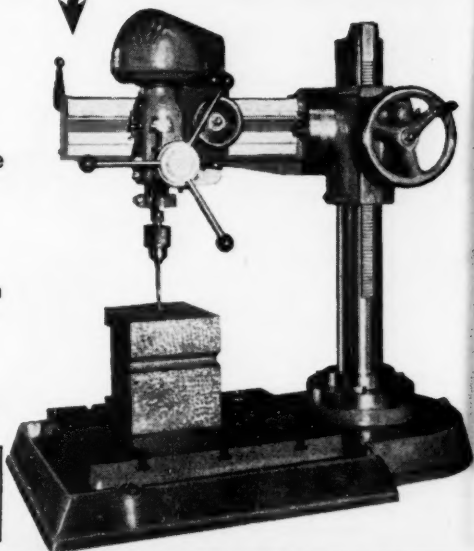
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which are passed through indentations **D**.

The nut, **I**, is then rotated counterclockwise, using handles, **J**, so that the tongue, **E**, will pivot counterclockwise and move the locating block, **L**, upward. Nut **W** is also unscrewed slightly. A connecting rod to be machined is now placed in the fixture from the right. The small end of the rod is positioned with the bottom of the rod resting on top of one cap screw, **Q**, with

the side of the rod resting against the other cap screw, **P**, and with the end of the rod resting against the locating pin, **S**. The large end of the rod is positioned in the vee of locating block **N**. Nut **I** is then rotated clockwise to move the locating block, **L**, downward on top of the rod, thus holding the large end of the rod securely. Nut **W** is also tightened to move the strap, **U**, against the rod, thus holding the small end of the rod securely between the cap screw **P** and the strap.

The table feed is then started, and the connecting rod is fed into the revolving cutters for the milling operation. When the machining is completed, the table is moved out of the path of the cutters and stopped. Nuts **I** and **W** are unscrewed; and the finished connecting rod is removed.

This milling fixture locates the work positively, holds it securely, and is altogether satisfactory in use. Therefore, it may be considered to be a well designed and efficient piece of manufacturing equipment.



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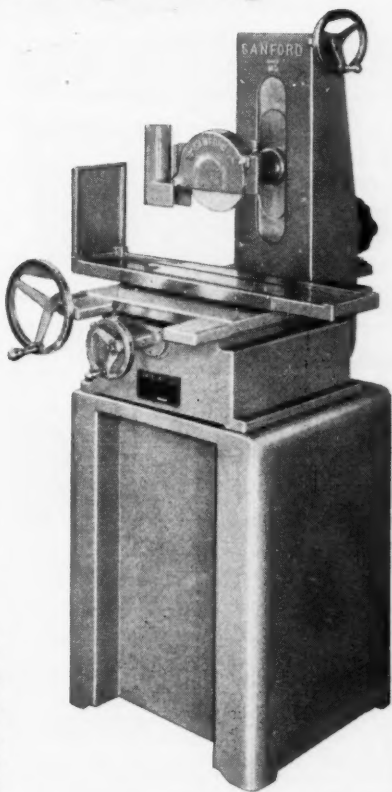
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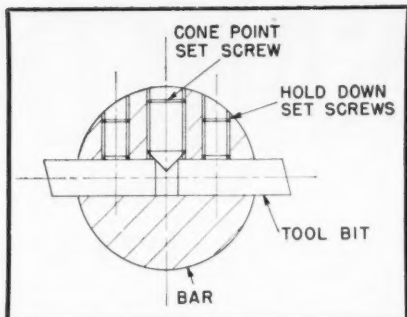
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Set Screw Permits Ready Adjustment of Boring Bar Tool Bits

By IRWIN MANSFIELD

IN using a boring bar equipped with a tool bit having cutting edges at either end, it is common practice to discard the tool bit after it has become worn undersize since there is no



Sketch showing how cone-point set screw permits quick and easy adjustment of boring bar tool bits

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way of adjusting the ends of the bit outward an equal amount to compensate for wear. The accompanying sketch shows a method whereby a boring bar can be adapted to permit the outward adjustment of its tool bit cutting edges as they become worn and thus eliminate the necessity of discarding tool bits long before their actual usable life has expired.

As may be readily seen, the bar utilizes two separate tool bits instead of a single bit, and is drilled and tapped in the center to receive a standard cone-point set screw which, when adjusted down, causes the bits to be advanced outward the required amount. The bits are then locked in place by tightening the two hold-down set

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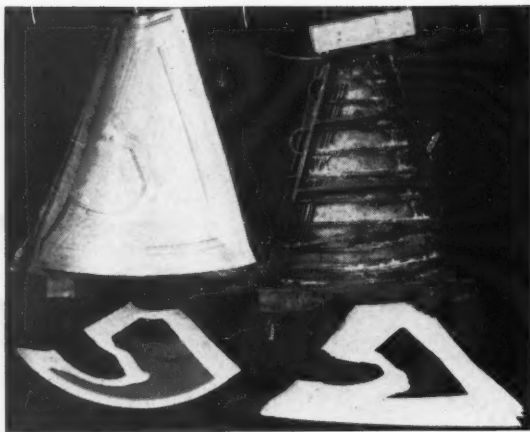
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(Left) Contact surface of electroformed metal-forming die. (Right) Rear surface of die showing coiled metal tubing used for heating and coating of sprayed aluminum to provide better heat transfer from coils to die.

screws of the boring bar. In addition to being used for adjustment purposes, the cone-point set screw also acts as a backup for the bits, thus allowing for the taking of heavy cuts without bit slippage.

Metallizing Aids Heat Transfer

By GILBERT C. CLOSE

HHEATING electroformed metal-forming dies is often accomplished by passing a hot medium (oil, steam, or water) through coiled copper tubing placed as closely as possible to the rear

surface of the die. In the shops at North American Aviation, Inc., heat transfer from the tubing to the die is expedited by using sprayed metal over both the coiled tubing and the back of the die. This spray-metal eliminates air space and provides a highly conductive pathway for the heat from the tubing into the die.

Simple Depth Gage Speeds Inspection

By H. G. FROMMER

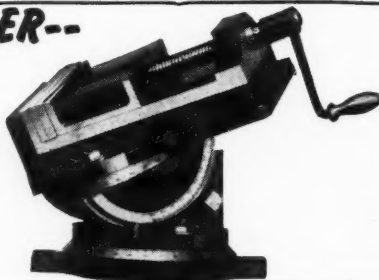
THE sketch herewith shows a handy economical-to-make depth gage which is designed to speed up hole inspection. The gage includes a knurled sleeve, **A**, which is faced on both ends and has a step milled across one face. The depth of this step is made to equal the total allowable tolerances of the depth of the hole in the workpiece **B**.

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PRECISION DRILL GRINDER—FOR ALL SMALL DRILLS

When you need sharp, small gauge or fractional drills in quantities—it costs real money to put an experienced mechanic to work on them.

With a Black Diamond, however, anybody can keep all small drills sharp, ready for any emergency—with lips accurately ground to exactly the same length, proper angle and with correct clearance for fast, precision drilling.

This motor-driven machine cuts grinding and drilling costs 30% and more, saves expensive drill stock, reduces work spoilage and drill breakage.

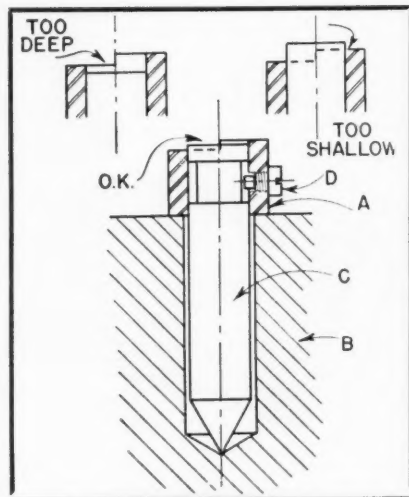
The built-in Diamond Point Dresser keeps the grinding wheel ever sharp cutting and the Web Thinning Attachment cares for all types of Notched points to perfection.

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BLACK DIAMOND SAW & MACHINE WORKS, INC.
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Inserted through the sleeve with an easy sliding fit is a rod, **C**, relieved on top for a retaining screw, **D**, which serves to prevent separation of the two major gage parts. The overall rod length must be such that the top of the rod is flush with the top of the sleeve when the rod touches the bottom of a hole drilled to the low tolerance.



Sketch of simple depth gage

To use the gage, the rod **C** is inserted into the hole in the workpiece in such a manner that the sleeve **A** fits evenly against the top of the workpiece. With a fingernail or finger tip, the operator then feels along the top of the gage sleeve and rod. A downward step from the lower sleeve surface to the rod top signifies a hole which is too deep. Two upward steps from the lower sleeve surface to the upper sleeve surface indicate that the hole depth is within the allowable tolerance. If the feel indicates that the end of the rod extends above the upper sleeve surface, the hole is too shallow.



FULL BALL BEARING

Completely Adjustable
**UNIVERSAL JOINT
DRILLHEADS**

STANDARD Only with

THRIFTMASTER

Full Ball Bearing construction coupled with Thriftmaster design and manufacturing dependability, assures smooth, steady, positive drill-head performance *that will last!*

THRIFTMASTER Universal Joint Drillheads

2 to 10 (or more) Spindles . . . Capacity to
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6" to 10" (or larger) Circle

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Special Fixed Center and Standard Eccentric Adjustable Drillheads, Multiple Spindle Automatic Reverse Tap or Drill Attachments.

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Division of Thomson Industries, Inc.

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STANDARD UNIVERSAL ADJUSTABLE AND SPECIAL FIXED CENTER DRILLHEADS

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JIG BORING

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Bulletin J

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COMPANY**

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MODEL 1236
36 IN. THROAT
12 GAUGE
CAPACITY

CIRCLE
CUTTING
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Included as
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machine

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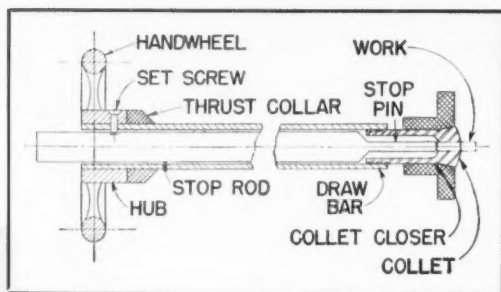


Fig. 1—Sketch of internal collet stop used with handwheel-operated drawbar

Internal Collet Stops

By ROBERT ROEDDER

ON second-operation lathe work, a collet stop is often essential, yet many machines have no provision for such a stop. If a drawbar is used on the second-operation machine, a collet stop can be readily provided by drilling and tapping the drawbar handwheel hub to accommodate a set screw for holding a close-fitting rod in the desired posi-

tion, as shown in Fig. 1. The other end of this rod is machined to readily slip into the collet and to include an integral pin or accommodate a separate hardened pin held in place by a set screw. As the drawbar is operated to close the collet, a hardened thrust collar located on the drawbar adjacent to the end of the handwheel hub bears against the end of the lathe spindle so that the drawbar and all parts connected to it, including the set screw-held stop rod, will be in the same relative position each time the collet is closed regardless of any variations in workpiece diameter. Thus, the draw-



Cut grinding costs . . . with rugged QUEEN CITY Grinders

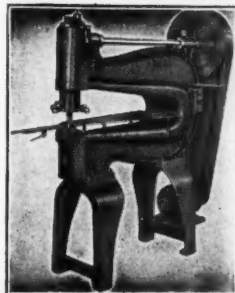
Queen City Grinders are built to stand up under the heavy work that pours through the shop daily. Noted for their durability, freedom from downtime and low cost, Queen City Grinders cut grinding costs to the bone. • Order today a battery of these low cost grinders and eliminate "ganging up" around one lone grinder.

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QUEEN CITY
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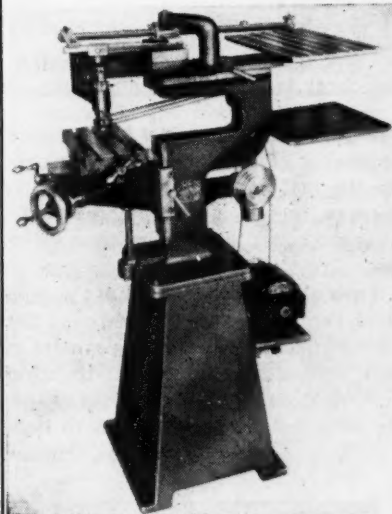
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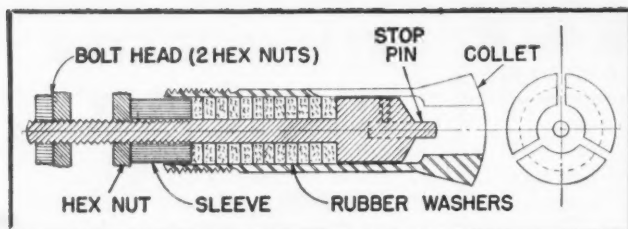


Fig. 2—Sketch of internal stop for use with spindle-nose-mounted collet closer

bar-operated stop provides for accurate positioning of each piece of work despite the fact that slight diametral differences between workpieces may cause the collet to be drawn in more or less.

When using a collet closer of the type which employs no drawbar through the spindle but is screwed on the spindle in place of the regular chuck, the stop must be a part of the collet. Many collets have no internal threads to hold such a stop. In such cases, rubber

type washers or O-rings are provided around the stop shaft, as shown in Fig. 2. The stop is then positioned as desired and locked in place by expanding the rubber washer with the aid of a pair of wrenches, one of which is used to hold the "bolt head" of the stop shaft from turning while the other is used to adjust a hex nut on the shaft against a cold rolled sleeve having a free fit in the collet and on the stop shaft. After the stop has been locked in position, the collet is placed in the machine, ready for use.

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Max. Temp.	Sizes	Price
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All prices are less controls. Any standard controls available for automatic temperature control.

- With Cooley design, the door is virtually another wall, equally insulated with the others—entire hearth is usable.
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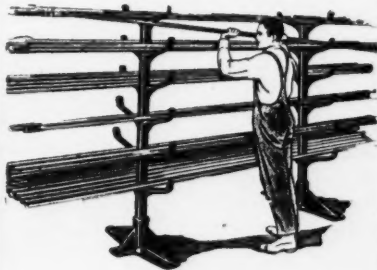
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The BROWN SECTIONAL RACK saves the time previously lost in end-hauling each bar of stock its entire length from the old-style, closed-side Rack, the Brown Rack requiring but a few inches of side movement. Each length, width and thickness of stock is displayed in gold-fish visibility for instant selection. Workmen waiting for stock are served without waste of time.



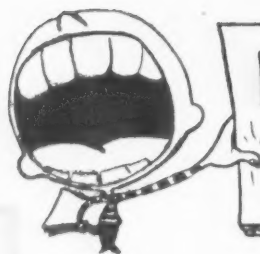
Any time you require additional storage space, all you need do is add more units. If you want to relocate it at any time, you can do so quickly for it is unattached to the building.

It is a simple, durable article made of metal in five styles. It can't burn, warp, sag or twist; depreciation is practically nil. SEND FOR BULLETIN No. 26-B DESCRIBING

BROWN'S QUICK-SERVE RACKS

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120 N. THIRD ST. READING, PA.
RACKS • VISES • CLUTCHES • COUPLINGS



NEWS OF THE INDUSTRY

National Broach Completes New Building

The National Broach and Machine Company, manufacturer of gear finishing and inspection machines, broaches, broaching fixtures, and special production machines, has moved into its new administration building located at Shoemaker and St. Jean Aves., Detroit 13, Mich. The new structure provides an additional 24,000 square feet of floor space for offices and the engineering department. The space formerly used for offices and engineering is now being used for manufacturing purposes.

Monarch to Make Further Plant Expansion

At a special meeting held recently, the directors of The Monarch Machine Tool Co., Sidney, Ohio, approved a further expansion in plant and equipment which Jerome A. Raterman, president, described as the largest addition yet to be made to the company's facilities for producing tracer-controlled automatic lathes and engine and toolmakers' lathes. The new construction will expand Monarch's present plant another 200 feet in length, and involves the building of three additional bays, two of which will be 300 feet long.



New administration building of National Broach & Machine Co., Detroit, Michigan

Interstate to Hold Second Annual Machinery Fair and Open House

The Interstate Machinery Co., Inc., has announced that the second annual Machinery Fair and Open House will be held Wednesday, November 14, through Saturday, November 17, at the Interstate warehouse and plant, 1431 W. Pershing Rd., Chicago, Ill. The show will open from 9:00 A. M. to 9:00 P. M. to everyone concerned with metal-working machinery. Refreshments and buffet meals will be served.

Over 2,000 new, used, and rebuilt metal-working machines will be exhibited in the Interstate warehouse. Many machines will be placed under power for inspection. Factory representatives of machinery manufacturers will demonstrate their companies' latest equipment. In addition Interstate's own machinery rebuilding plant will be in operation so that visitors will have an opportunity of seeing machines completely torn down and rebuilt. Experienced machinery men will answer questions and give advice on various production methods.

New Elgin Division to Handle Diamond Abrasive Materials

The Elgin National Watch Co., Elgin Ill., has announced the organization of a new Abrasives Division, which will be headed by C. R. Myer, manager. John F. Ireland will direct sales and D. H. Prentice will act as technical director.

In addition to diamond abrasives, the new division will market a line of accessories normally required in fine finishing operations.

Whiton

INDEPENDENT LATHE CHUCKS

All types of mountings



MULTI THRUST

Feature

Gives Jaws "Steel Finger" Action

- Tighter Gripping
- More Rigidity
- Greater Accuracy
- Even Distribution of Pressure



Try it yourself. Pick up a piece of work in your fingers. That's ordinary holding. Now squeeze . . . that's Whiton Multi-Thrust "Steel Finger" action.

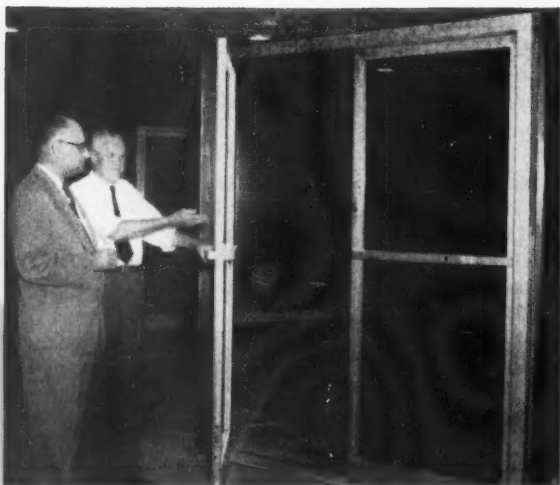
Work Holding Problems?
Write Whiton
Ask for catalog, too.



Makers of Fine Chucks • Steam Turbines
Centering Machines • Gear Cutting Machines

THE WHITON MACHINE COMPANY

NEW LONDON, CONN.



A. F. Davis, vice president of The Lincoln Electric Company, is shown opening the office door of the company's new 10 million dollar plant for Mayor Kenneth J. Sims of Euclid, Ohio, where the building is located.

Lincoln Electric Company Moves into New Plant

The Lincoln Electric Company has moved all executive and plant offices with their equipment to a new super-modern plant located at 22801 St. Clair Ave., Cleveland 17, Ohio. The office move, effected over a week-end, was but one step in the transferring of Lincoln's operations without losing any more than 10 per cent of production for the month during which the complete move was made.

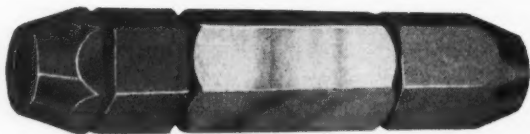
Pin-point planning made the move a smooth operation, with production on

each machine picking up at the new plant a few hours after stopping at the old. Raw material was moved out first while machines at the old plant were kept operating on the month's work which was in process. The

basic machines (shears and presses) ran out of work first and were moved to the new location where they began to work on the raw material previously stocked there. As material was processed through the old plant and machines ran dry, they were moved out to begin on the raw material which had been started in process by the first machines moved out. Operators went along with their machines which were quickly set into marked locations and hooked into the power lines. At the end of three weeks, practically all of the material in the old plant had been processed

COLLET TYPE PIN GAGE HANDLE

Bushings for cylindrical and thread plug gages



RED

GREEN

Complete line of gage supplies, handles, blanks, ring gage parts, etc. from stock.

HURON MACHINE PRODUCTS

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The high quality and accuracy of Standard Steel Specialty Taper Pins have won them wide acceptance. Milled from bar stock, straight to taper and to extremely close tolerances, these pins give 100% performance. The uniformity and accuracy of the pins saves valuable time at assembly, assuring you trouble free service.

Write for complete catalog giving information on taper pins, Woodruff keys, machine keys and machine racks.

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ALLIGATOR



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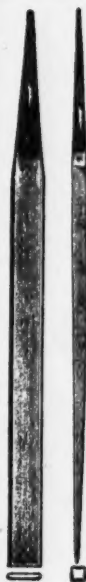
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cuts and sizes of both
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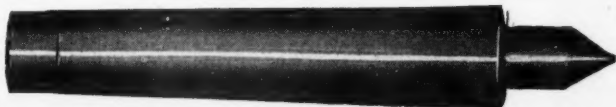
Carson - Newton Co.
61-71 MILL ST.
BELLEVILLE, NEW JERSEY



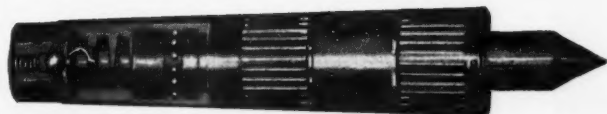
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LIVE CENTER

THE ORIGINAL
CONCENTRIC
LIVE CENTER



FASTER
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AUTOMATIC
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Patented

Operates 4 - 5 times faster than ordinary live centers.
Less overhang...means more rigidity, more working range.
Spring loaded spindle gives automatic tail stock adjustment.

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CONCENTRIC TOOL CORP.

2970 Huntington Drive
San Marino, California

and assembled into welders. The assembly lines were then moved to the new location where parts were now ready for assembly.

\$2000 Welding Prize Competition

A grand total of \$2000.00 in cash awards, double that of the previous year, plus a considerably increased scope of the competition to include

practical welding applications, marks the announcement of the 1951-1952 Prize Competition and Program of Awards by Eutectic Welding Alloys Corporation. This year's competition, open to engineers, metallurgists, researchers, instructors, welders, students, and all others qualified, features two categories: Category A for papers on "Welding Engineering and Theory" and Category B for papers on "Prac-

tical Welding Applications." Both divisions must cover technological and research aspects, procedures, and applications of the use of lower - melting (lower - than - parent) filler metals in the non-fusion welding processes.

Thirty cash prizes will be awarded in the various categories described above, the first prize (won last year by two Georgia Tech. students) being \$500. A full set of rules, entry blanks, and helpful suggestions on the preparation of papers may be obtained by writing to Eutectic Welding Alloys Corp., Dept. P, 172nd St. and Northern Blvd., Flushing, New York.



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and FINGERS
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Eject Automatically by Air
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— District Offices: Detroit and Cleveland —





STANDARD D - 4 Abrasive Band Grinder

Famous
for
Stamina

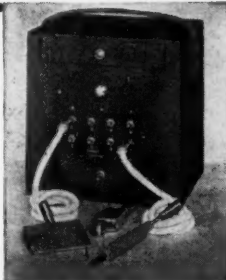
This new, streamlined bench type grinder, assures fast, quality finishing on metals, plastics, wood, fibre... at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36 1/4" band. The ideal portable unit.

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(Two-Jaw or Three-Jaw)

WRENCHLESS CHUCK

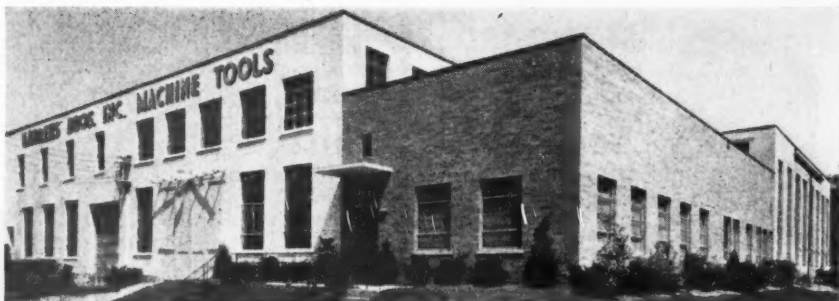
will pay for itself in 60 to 90 days on
production schedules by giving MORE
parts per hour at a LOWER cost per
part. Most round parts can be set in
the Barker Wrenchless Chuck without
stopping the machine. It saves time,
helps speed up production, and cuts
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Chuck shown here, replacing an ordi-
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from 18 to 24 pieces per hour. It can do it in your plant too.

Let us show you how!

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—Chuck Division—
THOMAS HOIST CO.
28 S. HOYNE CHICAGO 12



Expanded plant of Laurens Bros., Inc., Cincinnati 12, Ohio

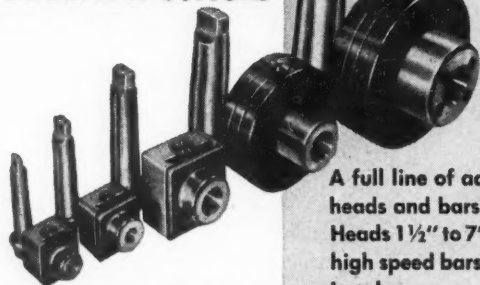
Laurens Bros. Completes Addition to Plant

Laurens Bros., Inc., dealer and re-builder of machine tools, has completed an addition to its plant at 2780 Highland Ave., Cincinnati 12, Ohio, according to Frank Laurens, vice president and former president of the M.D.N.A.

The 12,000 additional square feet of floor space provided by the new construction allows for the accommodation of a larger stock of machines, as well as increased facilities for machine tool rebuilding.

Founded in 1902, the company did business in Italy, Germany, and Switz-

*for greater RIGIDITY
more ACCURATE cuts*



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CRITERION

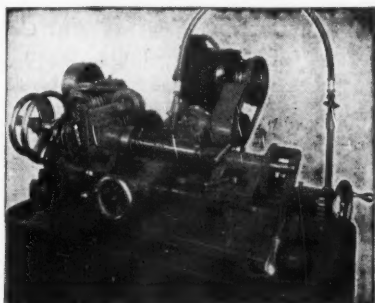
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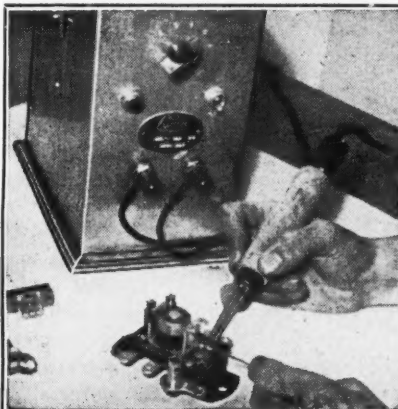


THREAD MILLING MACHINE

Also Pinion and Gear Cutting Machines, Cylindrical Sub-Presses, Cutter Sharpening Machines, Small Special Machinery. Cutters for thread milling and gear cutting.

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FOR FASTER, SAFER SOLDERING

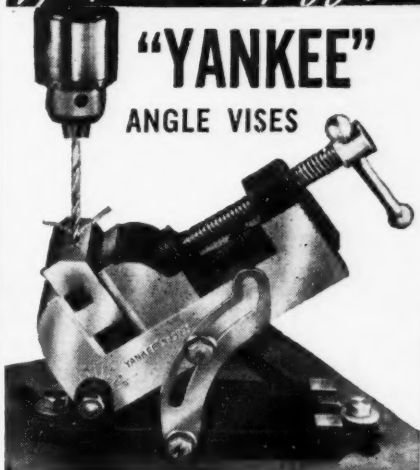
The Luma resistance method of soldering is the accepted way for small shops requiring single operation to large plants with many types of operations. Write for complete information about this remarkable tool.

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Jig in a Jiffy

"YANKEE"

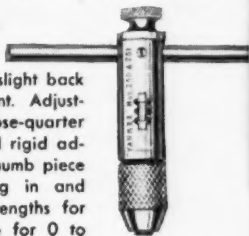
ANGLE VISES



Shortcut costs on small jobs with this fast-acting, economical jig. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and 2 3/4". Each vise supplied with grooved "V" Block for holding rounds.

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Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to 3/16" taps, one for 0 to 3/8" taps.



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Philadelphia 33, Pa.

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NOW PART OF



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OF THE WORLD

erland until 1939, when the Laurens brothers moved to the United States. The modern plant, now double its former size, includes adequate crane capacity for large machines and other production equipment. In addition to the new production facilities, a modern office, employees' lunchroom, and locker rooms have been installed. Charles Laurens is president of the firm.

Third Plant Maintenance Conference

The Third Plant Maintenance Conference will be held concurrently with the Plant Maintenance Show at Convention Hall, Philadelphia, January 14-17, 1952. Thirty-four separate discussions will be conducted. More than 100 experts, drawn from industrial firms all over the country, will conduct the panel discussions.

Six general conferences, 27 sectional meetings, and the annual banquet are scheduled. General conferences will consider basic problems of all industry, while the sectional meetings will be devoted to specialized subjects of interest to particular industries. Two hundred companies will display products and services necessary for maintenance. Both conference sessions and exhibits will place the principal stress on preventive maintenance. Advance registration cards and hotel information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, New York.

6 WEEKS!

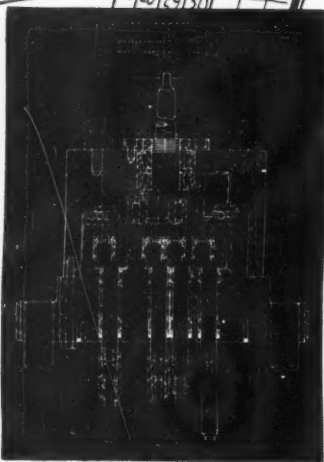


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IN NORMAL TIMES"



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4"
to 15 1/2"
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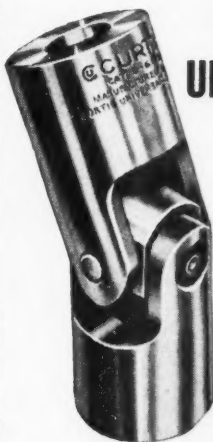


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trict on the near north side, this attractively designed building includes a large room displaying stocks of Pres-On abrasive discs and holders, Porcel-point mounted wheels, carbide and high-speed steel rotary files, carbide end mills, and the company's complete line of die and mold finishing special-

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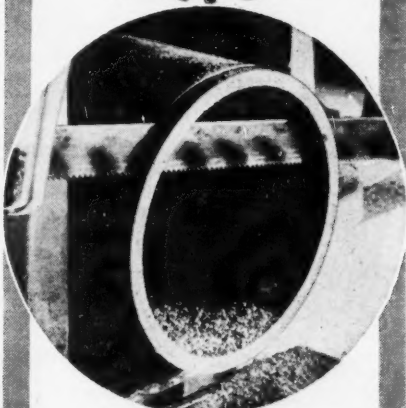


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ties. The new plant will augment the manufacturing facilities and processes of the company, and production will now include segments and abrasive wheels in resinoid, vitrified, and rubber bonds.

Safety Men Honored by American Die Casting Institute

An outstanding step in the field of

safety engineering in die casting plants received public acknowledgment when the Annual Doehler Award of the American Die Casting Institute was presented to the authors of the "Safety Manual for the Die Casting Industry." The Doehler Award, established in 1949, is made each year "for the outstanding achievement of the die casting industry." It was presented to Charles A. Sanford, industrial rela-

tions manager of the Cleveland Hardware and Forging Company, Cleveland Ohio; Norman Dress, personnel manager of Precision Castings, Inc., Cleveland, Ohio; and Byron S. Van Horn, safety director of the Doehler-Jarvis Corporation. These three men were directly responsible for the compilation and publication of the Die Casting Industry Safety Manual.

The Doehler Award presented by A. T. Lillegren, president of the American Die Casting Institute, during the annual meeting at the Edgewater Beach Hotel, included certificates and cash awards of \$500 to each of the three winners.

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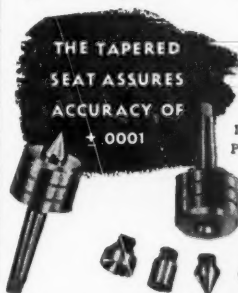
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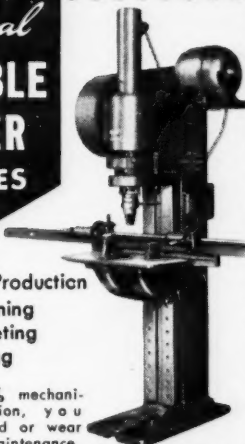
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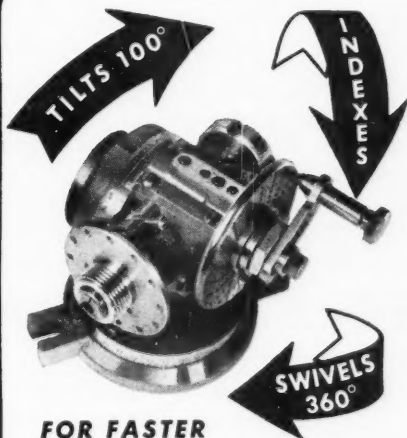
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John C. Sears Appointed Secretary of A.G.M.A.

American Gear Manufacturers Association, with headquarters at 301 Empire Bldg., Pittsburgh, Pa., has announced the appointment of John C. Sears as executive secretary of the association. Newbold C. Goin, former executive secretary, has joined the management consulting firm of Brenholts, Goin & Ogg.

Mr. Sears is a native of New Jersey. His career has included management assignments in several industries. For the past six years he has been resident staff member of American Associated Consultants, Inc., 250 Park Avenue, New York City, and manager of the Cooperative Wage Bureau, maintained in Pittsburgh by the steel industry for the development and application of the "Fair Day's Work for a Fair Day's Pay" program and principles.



John C. Sears



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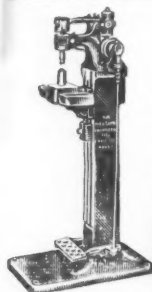
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New Plant Now Being Constructed by Chas. H. Besly and Company

As a result of an increasing demand for machine and cutting tools, Charles H. Besly and Company is building a modern one-story plant in South Beloit, Wisconsin, which will house both the Machine Tool and Cutting Tool Divisions of this company. Useful floor area will be increased by approximately 20 per cent over the present plant. Productive capacity, due to improved materials flow and additional tools and handling equipment, will be increased



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HIGH SPEED Hammer Co., Inc.

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Wash drawing of new plant of Charles H. Besly & Co., South Beloit, Wisconsin

approximately 100 per cent over the present output. According to K. Y. Taylor, executive vice president, the new plant should be in operation not later than March of 1952.

Charles H. Besly and Company was established at Chicago in 1875, and the manufacture of taps was begun at Beloit, Wisconsin, in 1885. The firm has been a pioneer in the development of

grinders and small tools in the Midwest for nearly three-quarters of a century. The Machine Tool Division builds a wide variety of production grinders used by automotive, aircraft, farm machinery, tool manufacturers, and their suppliers. Carbon and high speed taps are produced by the Cutting Tool Division, which will occupy a major portion of the new building.

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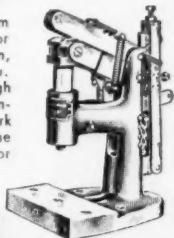
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Gilman Company to Publish Machine Tool News Flashes"

The Russel T. Gilman Co., 525 E. Michigan St., Milwaukee, Wis., sales representative for Hauser Machine Tool Corporation and other Swiss manufacturers of machine tools, has announced the publication of "Machine Tool News Flashes," a regularly issued bulletin devoted to current news of the general machine tool market. Topics to be covered will include availability of

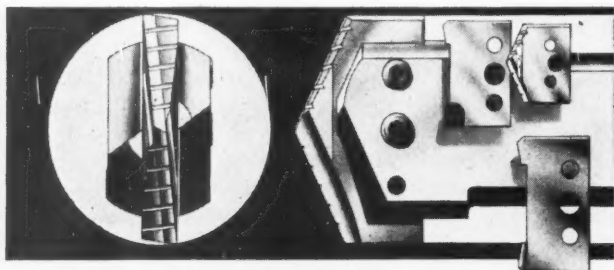
scarce items, new adaptations and installations, and related items.

Copies of the bulletin will be mailed free upon request by executives of manufacturing companies in Iowa, Illinois, Wisconsin, and Minnesota.

National Officers Elected at Instrument Society Conference

The Instrument Society of America at its Sixth Annual Instrument Conference and Exhibit held recently in Houston, Texas, elected the following national officers: Dr. Arnold O. Beckman, president; David M. Boyd, Jr., vice president; and Robert T. Sheen, vice president. Officers still incumbent include W. A. Wildhack, 1st vice president; N. L. Isenhour, vice president; G. R. Feeley, treasurer; and Richard Rimbach, secy.

The I.S.A., a non-profit scientific and educational organization formed in 1945 to advance the arts and sciences connected with instrumentation, has attained world-wide recognition as an outstanding forum for the exchange



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256 cutter sizes, 1 to 5 inch dia., in steps of $\frac{1}{64}$

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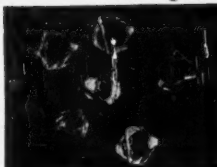
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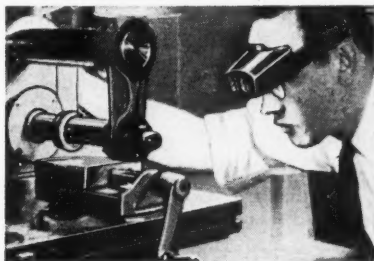
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and dissemination of information in this field. Since its inception five years ago, it has grown to include 51 sections and some 5,000 members.

Lincoln Electric Appoints New Chief Engineer

L. K. Stringham has been appointed chief engineer for The Lincoln Electric Co., Cleveland, Ohio. G. G. Landis con-

tinues as engineering vice president. Mr. Stringham, an electrical engineer and graduate of Cornell University, has been with Lincoln since 1933. He has worked continuously in the engineering department where his experience has included experimental research, as well as product development and application. He has worked on the design of welding machines as well as electrodes and fluxes. During the last ten years his development work in fused and agglomerated fluxes has been important in extending the uses of the hidden arc welding process. He has also been responsible for the development of equipment for the manual and semi-automatic application of this welding process.



L. K. Stringham

For the past two years Mr. Stringham has been director of welding development. He is on the board of directors of The Lincoln Electric Company, a member of the N.E.M.A. Navy Committee for the Development of Low Hydrogen Electrodes, and a member of the A.W.S.-A.S.T.M. Committee for Filler Metal.

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Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from $\frac{1}{8}$ " to $\frac{3}{4}$ " U.S.S. Inexpensive — Last for years.



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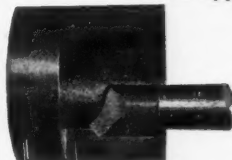
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WITH EXTRA ADVANTAGES!

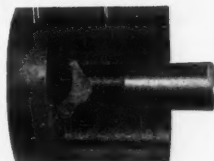
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Made of Super-High-Speed steel or carbide tipped.



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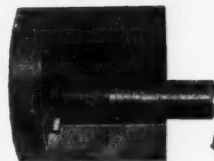
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and facing



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threading



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for boring holes
of 1/8" min.
diameter.



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41 East Hartsdale Ave.
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Inquiries from Agents Invited

DoAll Appoints New Sales-Service Managers

Major appointments in top managerial positions in four DoAll sales-service stores have been announced by The DoAll Co., Des Plaines, Ill., manufacturer of machine tools, gage blocks and accessories, and industrial supplies. Henry F. Sokol has been appointed general manager of the DoAll Detroit Company at 15010 Plymouth Road. Mr.

Sokol has been associated with the DoAll Company since 1947 in sales and service work and was formerly general manager of the DoAll Grand Rapids Company.

Kurt G. Krebs has succeeded Mr. Sokol as general manager of DoAll Grand Rapids, 1951 Grandville Ave., S. W. Mr. Krebs has also been with the DoAll Company for some time in a sales and service capacity and has ten years

of experience as a design engineer in the scientific instruments field.

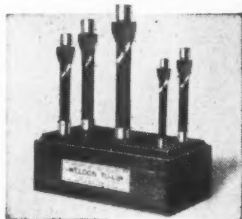
John B. Reichle has been named general manager of the DoAll Toledo Company at 2952 Monroe Street. Mr. Reichle joined the DoAll Company in September 1950 and, after completing an extensive training course in the DoAll plants at Savage, Minnesota, and Des Plaines, Illinois, he was assigned to DoAll Toledo as a machine tool specialist. Previous to 1950 he worked as a toolmaker.

Clayton C. Clegg has been appointed general manager of the DoAll Pittsburgh Company at 600 Rebecca Avenue.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

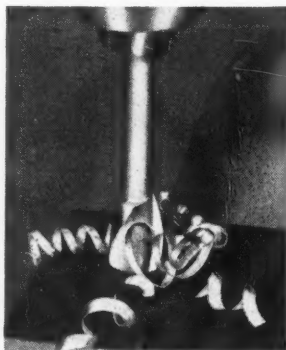
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Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.



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3000 WOODHILL ROAD

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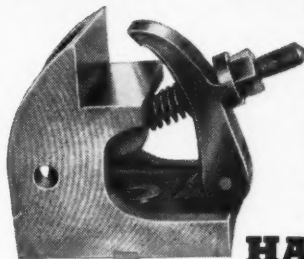
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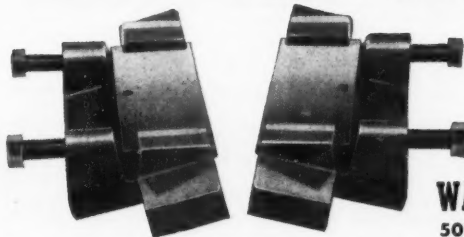
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Little need for Expensive jigs or Fixtures



Fixtures make themselves popular and profitable in any shop—are used in either horizontal or vertical position. Will hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on bottom as well as on back. Generally sold in pairs. Made in 4 sizes—to hold stock from $\frac{1}{2}$ to 5 inches.

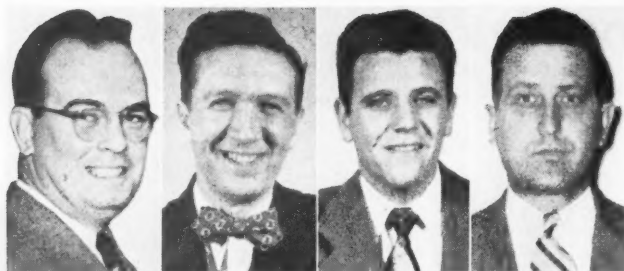
HART MACHINE VISEJAWS

These jaws are very useful on any machine table. They clamp or bolt to the table, the angles firmly holding the work down. Each hardened tool steel jaw measures 3"x6"x $\frac{1}{2}$ ". The angle edges are serrated.

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(Left to right) Henry F. Sokol, Kurt G. Krebs, John B. Reichle and Clayton C. Clegg

phia, Pennsylvania, for more than five years.

Mr. Clegg was previously assigned to the DoAll Philadelphia Company in 1946 as a machine tool specialist after completing an extensive training course in the DoAll plants in Savage, Minnesota, and Des Plaines, Illinois. Prior to joining DoAll, Mr. Clegg had seven years of sales experience and worked in the experimental department of the Edward G. Budd Company in Philadel-

Symposium on Testing Metal Powders and Metal Powder Products

A Symposium on Testing Metal Powders and Metal Powder Products consisting of several technical papers by leading authorities in this field will be the technical feature of the 1952 Spring Meeting of the American Society for Testing Materials to be held during the week of March 3 at the



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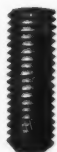
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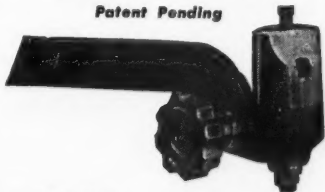
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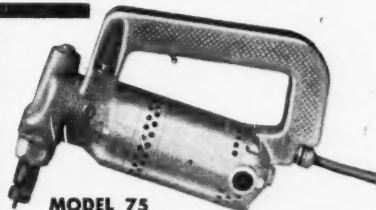
RANGE $\frac{1}{2}$ " TO 3" RADIUS (MODELS ALSO
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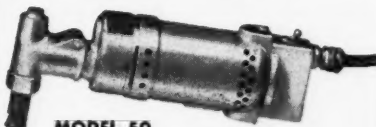
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JEMCO... Electric Nibblers



MODEL 75



MODEL 50

For speeding up nibbling jobs, Jemco Electric Nibblers provide an effective and economical solution. Made in two models... No. 75 for cutting 14 gauge (.0747)... No. 50 for cutting 18 gauge (.0478) hot rolled sheet steel. Other materials in proportion. Jemco Electric Nibblers handle flat or corrugated sheets... uneven surfaces... and can nibble out corners! Cutting may be started anywhere on the material if access hole for anvil is made. Tools operate on either DC or AC... 110 or 220 volts. Feed: 3 feet per minute. Nibbling is done better, easier and faster with Jemco. Send today for full details and informative folders.

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Hotel Statler in Cleveland, Ohio. The symposium is being developed by A.S.T.M. Committee B-9 on Metal Powders and Metal Powder Products which includes in its personnel technical men representing leading consumers and producers of these products.

The proposed symposium should serve as a medium of exchange of information for all who are interested in this field. Papers which are concerned with any phase of the testing of metal

powders or of parts fabricated are invited. It is suggested that anyone interested in contributing such a paper contact F. V. Lenel, secretary of A.S.T.M. Committee B-9, Rensselaer Polytechnic Institute, Troy, New York.

Westinghouse Air Brake Company Acquires Melpar, Inc.

Edward O. Boshell, chairman and president of Westinghouse Air Brake

Co., Wilmerding, Pa., has announced that his company has purchased all of the stock of Melpar, Inc., recognized as one of the leaders in the research and development of electronics. Melpar has approximately 150 graduate engineers and maintains offices and laboratories both in Alexandria, Virginia, and Cambridge, Massachusetts. The firm is actively engaged in the research and development programs of the armed services. These include prime contracts with the Air Force, Navy and Signal Corps, covering the fields of radar, sonar, communications, guided missiles,

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ADJUSTABLE
TOOL
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Vise-grip jaw runs full length of cutter channel, firmly and safely holds tool bits of all shapes, sizes and materials

Specifications		
Model	Size	Tool Capacity
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

With 15° or parallel cutter channel, left or right hand

ROBERT H. CLARK COMPANY
Beverly Hills, California Dept. MM11
Manufacturers of Precision Cutting Tools

For **SAFETY** in marking all kinds of Metal

Use SAFETY "HEVI-BEVL" LETTERS and FIGURES



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Write for Bulletin L7-50.

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SAFETY STEEL STAMPS

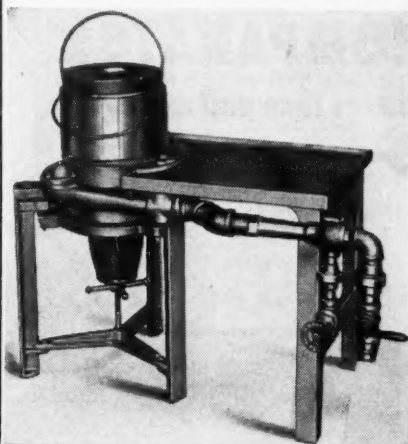
158 East Carson Street • Pittsburgh 19, Pa.

FORGES



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MELTERS



The small AGF Soldering Iron Heater No. 2 shown above has a heating space 3 1/4" x 1 3/4" x 4 1/2" — capacity two, four pound irons.

The AGF Regular Melter No. 3 has a crucible capacity (when 3/4 full) of 37 lbs. (Troy) of GOLD. Used widely in mints, manufacturing jewelers and laboratories, it can also be adapted for determination of the fusibility of coal ash.

Write for literature.



AMERICAN GAS FURNACE CO.
976 LAFAYETTE STREET, ELIZABETH 4, N. J.

computers and miniaturization. In addition to these diverse electronics activities, the Melpar organization also maintains a very complete chemical laboratory.

Thomas Meloy, now president of Melpar, Inc., will continue in that same capacity and will retain his entire staff and organization. Headquarters will remain centered at Alexandria, Virginia. Continuing also are Edward M.

Bostick, executive vice president, and Dr. William Tuller, engineering director of the organization.

New Export Company Formed by Norton and Behr-Manning

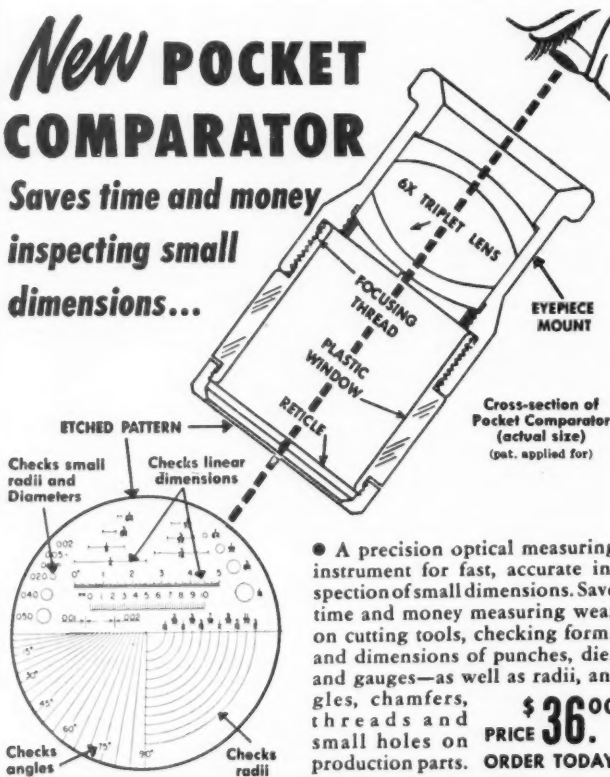
The formation of a new company to be known as Norton Behr-Manning Overseas, Incorporated, has been announced by the Norton Co., Worcester,

Mass., grinding wheel and abrasive product manufacturer, and its subsidiary, Behr-Manning Corp., Troy, New York, manufacturer of coated abrasive products. The new company will handle all of the export business and direct the subsidiary plant operations of these two corporations throughout the world. Headquarters will be in Worcester, with branch offices in New Rochelle, New York, and New York City.

The directors of the new company, who are also directors of the Norton Company or Behr-Manning Corporation, include: Milton P. Higgins, Ralph F. Gow, Herbert A. Stanton, Elmer C.

New POCKET COMPARATOR

Saves time and money inspecting small dimensions...



● A precision optical measuring instrument for fast, accurate inspection of small dimensions. Save time and money measuring wear on cutting tools, checking forms and dimensions of punches, dies and gauges—as well as radii, angles, chamfers, threads and small holes on production parts.

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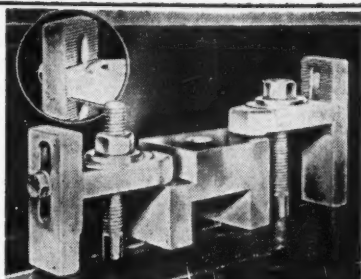
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Drop-forged steel frame easy to read. "No Glare" graduations. Guaranteed accuracy and unsurpassed workmanship. For greater savings in dollars and better satisfaction, use "Scherr Tools".

Complete stock. All sizes — MM. or Inch.

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For inside - outside and depth measurements in 1/1000, 1/128, 1/10mm and 1/20mm.

If not available from your dealer, order direct.

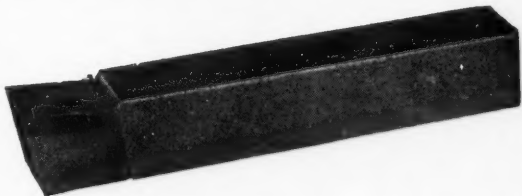
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COMPLETE LINE OF PRECISION INSTRUMENTS
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MADE IN 2 TYPES—

"GENERAL PURPOSE"
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Our "General Purpose" carbide tipped tools are used for most turning, facing and boring operations of cast aluminum and non-metallic materials. The "Steel" type are used for steel cutting.

Always tell us the material you are machining.

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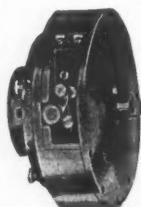
73 WEST BROADWAY

NEW YORK 7, N. Y.

Schacht, A. Donald Kelso, and Henry M. Elliot. Officers of the company are: president, Herbert A. Stanton; executive vice president and general manager, A. Donald Kelso; vice presidents, Philip N. Cooke, Paul A. Krumdieck, Frank M. Ryan, Jules A. Schaetzel, and Henry J. Sheehan; treasurer, William J. Magee; assistant treasurer, Joseph P. Morano; secretary, Curtis M. Clark.

Ace Abrasive Laboratories Expands Engineering Service Department

Ace Abrasive Laboratories, 250 W. 57th St., New York 19, N. Y., manufacturer of laboratory graded "Star-Dust" diamond lapping compounds and diamond powders, has expanded its Engineering Service Department to accommodate the increasing number of requests for information on the correct use of abrasive materials, according to an announcement made by Benjamin Greenfield, president. Because of rearmament and the necessity for extremely high precision finishes, many engineers and shop men are said to be confronted with specialized problems of this kind for the first time. Mr. Greenfield has stated that his company's field engineers are equipped to help such men with their problems if complete details are furnished.



M-D Facing Heads With Automatic Feed

Can be attached to Boring Mill Bar, and Drilling or Milling Machine spindles. Single point tool travels radially, from center outward or reverse; feeds automatically. Sizes 6" to 46" diameter.

Write for circular.

MUMMERT - DIXON CO.

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Gooch Appointed Assistant Plant Manager

J. W. Gooch has been appointed assistant plant manager in charge of manufacturing operations in the production of band tools for The DoAll Co., Des Plaines, Ill. Mr. Gooch was with The DoAll Company from 1940 to 1948 as general manager in charge of operations in saw manufacturing. In 1948, he joined Leader Electric Company of Chicago, manufacturer and distributor of industrial and commercial lighting fixtures, as general manager of operations.



J. W. Gooch

Revised Gage Standard Issued by A.S.A.

A revised edition of the American Standard for Screw Thread Gages and Gaging has been approved by the American Standards Association. This edition brings up-to-date the methods for checking threaded products to see if they comply with the requirements

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We are fully equipped to **GRIND OR MILL** a complete range of CAMS to your specifications on our **ROWBOTTOM** Cam Milling Machines.

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Threaded Plastic Balls
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ALSO SCREW CLAMPS, MACHINE VISES, FIXTURE
UNITS, MAGNETIC BLOCKS AND ROTARY TABLES.

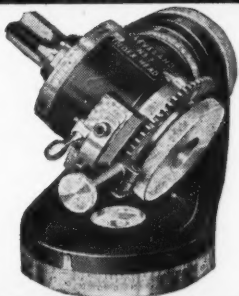
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MUSKEGON HTS., MICH.

TOOL HOLDER INDEXING HEADS



Hold 1/16" up to 1 1/2" Collets
5C or 1AM Collets and Brown &
Sharpe or Morse Taper. Will ad-
just to any compound angle.

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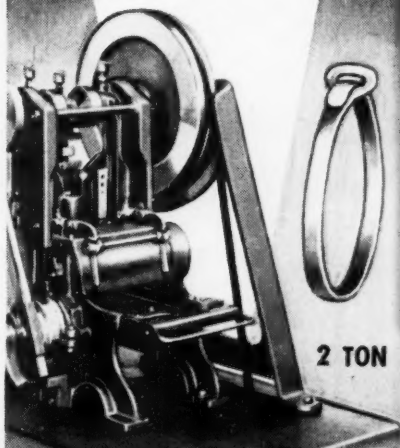


has more important features . . . for
MORE PRODUCTION . . . FASTER
. . . AT LESS COST . . . than any
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60,000 PER HOUR

Two Automobile HOSE
COUPLINGS were cut . . .
at every press stroke . . . to
DOUBLE UP CAPACITY.
What can the FLEXPRESS
do for you?

The feed mechanism is
not an attachment but
part of press.



2 TON

Ace Tool & Die Works

910 Baymiller St. Cincinnati 3, Ohio

for Unified and American Screw Threads for Screws, Bolts, Nuts and Other Threaded Parts, B1.1-1949. The Unified Threads were approved in 1949 by Great Britain, Canada, and the United States. The standard has tables for W and X tolerances on lead, half angle of thread; major, minor, and pitch diameter; and wear allowances on pitch diameter, for GO, HI, and LO thread gages, Z tolerances for plain plug gages for checking the minor


diameter of internal threads and the major diameter of external threads. The terms "HI gage" and "LO gage" are now applied to the gages previously called "NOT GO gages" and used for checking external and internal threads, respectively.

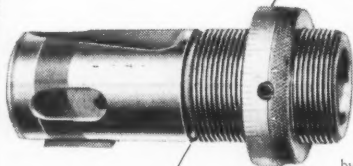
A general table provides the formulas for computing the limits of gages and setting plugs for external threads, and for gages for internal threads. The numerical values of these limits are

presented in a 60-page table, for threads according to the American Standard B1.1-1949. The data for Unified Threads are printed in heavy type. The table covers a nominal diameter range from 0.060 to 6 inches and the series UNC, NC, UNF, NF, UNEF, NEF, 8N, 12 UN, 12 N, 16 UN, and 16 N.

Copies of the American Screw Thread Gages and Gaging, B1.2-1951, may be obtained from the American Standards Association, 70 45th St., New York 17, N. Y., or from the American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y. at \$4.00 each.

for Quick Adjustments on multiple spindles

USE  SCULLY-JONES
"QUICK-LOCK"
ADJUSTABLE ADAPTERS
and SPINDLE EXTENSION
ASSEMBLIES



a Make quick tool changes: The pilot nose makes adapters easy to insert—reduces binding. The under undercut provides relief for any upsetting of body caused by press fit of Woodruff key.

b reduce set-up time: It is easy to make adjustments, quickly and accurately. The Quick-Lock Nut locks any place on adapter thread by only a quarter turn of set screw—saves time on every adjustment.

meet most requirements: Adjustable Adapter Assemblies are made in a wide range of standard sizes. Spindle Extension Assemblies in two styles—1800 and 1900. They meet most requirements for extending spindles and altering existing multiple spindle set-ups.

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WRITE FOR BULLETIN No. 6-50
Shows complete information
and prices.

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YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

**INCREASE
PRODUCTION
REDUCE
COSTS**

DURANT ROLL FEEDS

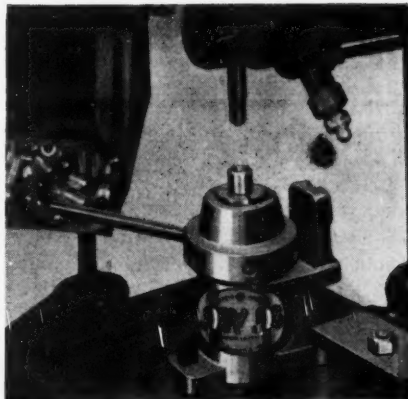


Accurate Feeding
Reversible
Easy to install
Highest quality
Immediate delivery

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JIFFY JIG

This fast, accurate, low-cost collet-type work holder speeds secondary operation drilling, milling, tapping, etc., either horizontal or vertical. • Guide bushing support (not shown) for cross hole drilling. • Spring ejector (optional) speeds work. • Simple, dependable, proven in service. Send for our folder.

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"...it's the bushing that makes
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To maintain maximum accuracy in drilling operations, use the bushing that's precision made for the job . . . use Acme! Write for catalog.

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THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

Metal-Working News in Brief

Promotion of **Herbert J. Mossien** as head of the Analytical Instrument Sales Department at Bausch & Lomb Optical Co., Rochester, N. Y., has been announced. The youngest department head in the firm's Scientific Instrument Division, he succeeds **Kenneth E. Reynolds**, who recently was appointed head of Bausch & Lomb's newly-created Defense Contract Department.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa., has announced the appointment of **John E. Groves** as director of industrial relations and **Ralph L. Ostrander** as manager of labor relations.

— o —

The Wagner Electric Corp., St. Louis, Mo., manufacturer of motors, transformers, and industrial and automotive brake products, has announced the appointment of two new branch managers in the electrical division. **M. B.**

Atkinson has become manager of the Detroit office, succeeding **R. L. Wells**, who retired, and **A. W. Maas** has been appointed manager of the San Francisco electrical office, succeeding **E. D. Pike** who also retired.

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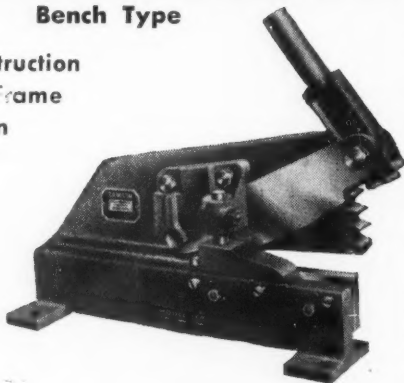
Rite-Way Tool Company, with headquarters located at 1612 Potomac Ave., Pittsburgh, Pa., has been organized by **Oliver B. Schmeltz** and **Thomas M. Rees** to market standard and special metal cutting tools and machine tool accessories. **Glen R. Kraus** and **Elmer E. Hafenbrak** will represent the company in the Tri-State area.

SAMSON HAND SHEARS

Bench Type

- All Steel Construction
- Unbreakable Frame
- Easy Operation

**IMMEDIATE
SHIPMENT**



Catalog of Metal Working Equipment furnished on request.

SIZE	No. 3R3	No. 3R4	No. 3R5	No. 3R6	No. 4R10
Cuts sheet or plate up to	14 ga.	1/8"	3/16"	1/4"	5/16"
PRICE	\$16.45	\$23.80	\$30.15	\$63.80	\$99.25

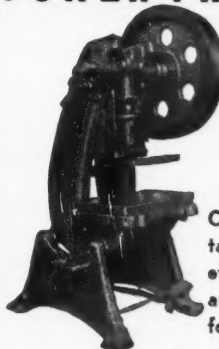
f.o.b. New York, prices subject to change.

JULIUS BLUM & CO., Inc.

Established 1910

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RECLINABLE POWER PRESSES



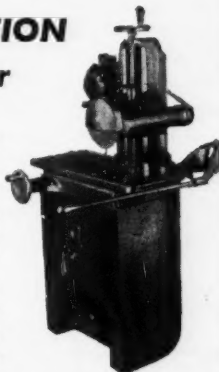
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year serving worldwide industry with Patent Percussion, Open Back, Double Crank, Punch, Horn, and Toggle and Straight Side Presses, Dial and Roll Feeds.

ZEH & HAHNEMANN CO.
190 VANDERPOOL ST., NEWARK 5, N. J.

PRODUCTION Jumper

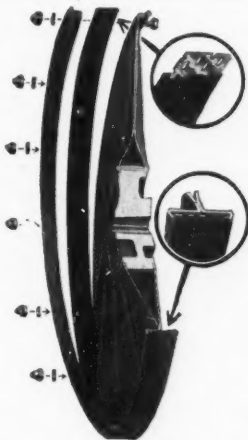


Crosman's hand operated "T" Grinder ups production, puts money in your pocket. The "T" small in size, takes big jobs in its stride—grinds dies, tools and parts up to 4" wide, 8" long and 10" high with accuracy and excellent finish.

"T" SURFACE
GRINDER

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EAST WALPOLE • MASS.



Cross-Sectional View

Wheel speeds to 1,800 RPM. Demountable tires of steel-centered, molded rubber. Quick and easy to change. No special tools. No down-time.

More and Better Band Saw Production with... CARTER RIGID WHEELS & Quick-Change Tires

• Revolutionary speeds and output increases. Avoid idle time. Get volume production with perfect safety for workmen, equipment, material and finished work.

New Literature FREE

CARTER PRODUCTS CO., Inc.
47 Mt. Vernon, N. W. — Grand Rapids, Mich.

Metal-Working News in Brief

Frank M. Aldridge, president and principal owner of the J. W. Kelley Co., 3401 W. 140th St., Cleveland 11, Ohio, producer of special lubricants, cutting, grinding, and quenching oils, drawing compounds, and heat-treating products, has announced that the name of the company has been changed to **Aldrich Industrial Oils, Inc.**

Nicholas M. Molnar, president of Fine Organics, Inc., New York 3, N. Y., has announced that the company has been awarded a research contract to develop production methods for critical chemicals by the U. S. Navy Ordnance Bureau.

— 0 —

Hanna Engineering Works, Chicago, Ill., has appointed **Sweetland-Affleck Corporation** as exclusive dealer for

central and southern California for its line of pneumatic and hydraulic cylinders and control valves. The Sweetland - Affleck office at 940 N. Fair Oaks, Pasadena, will handle all of California south of Fresno, while central California will be covered from the office at 405 Montgomery St., San Francisco.

— 0 —

The Moore Special Tool Co., Inc., Bridgeport, Conn., has been granted U. S. Patents 163,076, 2,515,146, and 2,559,180 on its No. 2 Jig Grinder, which is described as a precision machine tool that grinds straight and tapered holes, and regular and irregular contours.

PRECISION CIRCULAR CUTTERS



MEYCO carbide tipped and solid carbide cutters have earned an enviable reputation in plants where long tool life and precision workmanship is a MUST.

These cutters can be furnished in various diameters and thicknesses to meet the requirements of individual applications.

Saws and cutters, both carbide tipped and solid carbide, will aid production and precision in your slotting, venting, slitting and grooving operations . . . and they will be manufactured to your specifications. Please furnish complete specs and quantities desired when requesting prices and indicate material to be cut. MEYCO experience in the manufacture of precision tools, since 1888, is at your disposal.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

Columbia

TOOL STEELS for
all tools for all purposes



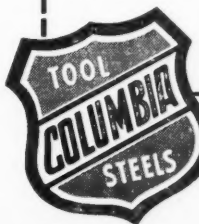
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Precision, milled-from-
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Set Screws, Milled
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ship immediately—
others, well, you know how it is,
they'll take a little time.

WHERE

For special
jobs con-
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local Industrial Distributor.



Wm. H. Ottemiller Co.
YORK, PENNA.

November, 1951

Send for
FREE SAMPLE!



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LATHE CENTER LUBE**

See for yourself

. . . at no cost

. . . how superior it is!

*Stops wear, scorching,
burning, breakdown*

• Do you use white lead or ordinary grease to lubricate lathe dead centers? If so, do this . . . write for a trial tube of Dixon Lathe Center Graphite Lubricant.

We'll send you a handy tube of Dixon Lube **ABSOLUTELY FREE**. Once you try it, we are certain you'll swear by it forever!

Remember, this is no ordinary lubricant. It's special throughout . . . combines Dixon *Natural Graphite* and special lubricating compounds to provide *great film strength*. That's why it withstands terrific pressure and friction!

ALL YOU NEED DO is write to us (letter or post card), requesting free sample. Just give your name and position, and your company's name and address. Joseph Dixon Crucible Company, Jersey City 3, N. J.

DIXON

Graphite

LATHE CENTER LUBE

Sold through Distributors



MODERN MACHINE SHOP 315

Metal-Working News in Brief

Sonnet Supply Co., 580 N. Prairie Ave., Hawthorne, Calif., has been appointed West Coast distributor for Gorham Tool Company, Detroit. Sonnet will carry the complete line of Gorham standard cutting tools and allied products, while the company's staff of six traveling sales engineers will serve western customers on Gorham special tool requirements.

George H. Whitehouse, general manager, Snyder Tool & Engineering, Detroit 7, Mich., has announced the appointment of **William C. Goeckel** to the post of assistant sales manager.

— o —

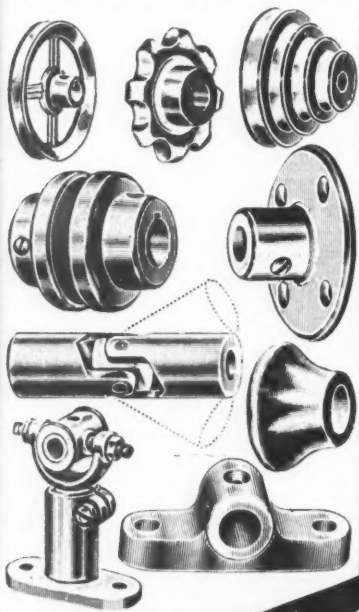
Janette Mfg. Co., Chicago 6, Ill., has announced the appointment of **O. J. Maag** as sales manager and **F. C. Hartmann** as assistant sales manager. Mr. Maag, who has been assistant sales manager since July 1948, was formerly

sales promotion manager for Shaffer Bearing Company. Mr. Hartmann, his assistant, came to Janette from Continental Can Company.

— o —

Edward Burke has been named authorized sales representative for the Norgren line of pneumatic products in northern California, according to Jack M. Evans, sales manager of C. A. Norgren Co., Denver. At present, Mr. Burke heads The Burke Company in San Francisco which is the new Norgren headquarters for northern California, including the counties of Monterey, Kings, Tulare, and Inyo.

DELIVERY from STOCK

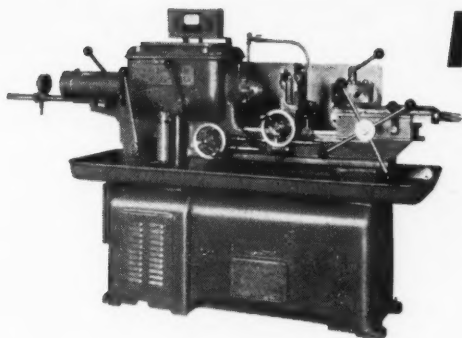


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PRODUCTION
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All items shown on this page, and many others, are in our complete stock of die cast products ready for immediate shipments. Use Chicago Stock Parts to save time and money. No dies to build — no stock to carry.

For complete
information
write for
Catalog No. 53M.





HERE IT IS!

The new Simmons No. 2 Turret Lathe, offered to you with three distinct advantages:

- **Low Cost**
- **High Precision**
- **Early Delivery**

Plain or Back-Geared — Forged steel spindle with anti-friction precision bearings, friction clutch and brake. Spindle nose, 2 $\frac{3}{8}$ "-8.

1 $\frac{1}{4}$ " bar capacity—14" swing over ways. Micro-Speed Drive offers infinite speeds — plain, 375 to 1500 RPM; back-geared, 44 to 750 RPM — for bar or chucking work. Power feed to turret.

Write today for complete details.

SIMMONS MACHINE TOOL CORPORATION

1745 North Broadway, Albany 1, N. Y.

N. Y. Office: 50 East 42nd St.

At last! A LOW COST AUTOMATIC No Snatch Horizontal STOCK REEL

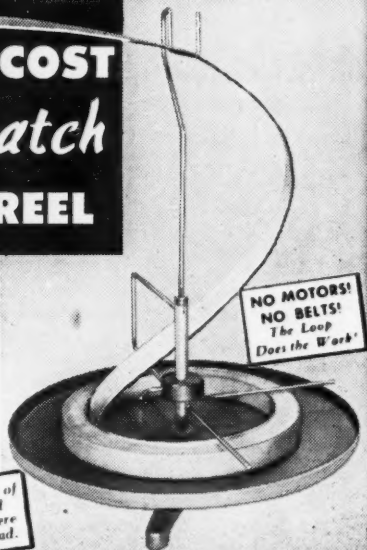
THE JACO REEL

U.S.
Pats.
Pending

Rotates at just the speed to suit punch press feed. No power needed. Stock is taken from center of coil which lies on turntable. Natural spring of uncoiling material develops torque sufficient to rotate the 30" diam. ball-bearing mounted platen. Will handle practically any resilient coiled material up to 6" wide. *WRITE Today for Details.*

Attention Mfrs. Representatives: Exclusive Sales Territories Open. Wire or Write.

Hundreds of
Satisfied
Users—here
and abroad.



JACO DEVICES, Inc., 102 High Street, Hingham, Mass.

Metal-Working News in Brief

Two new sales engineers have been appointed by Harvey Tool Service, Cleveland, distributor of Modco metal cutting tools produced by Modern Corp., Detroit, Mich. The new men, **Nels Grashaw** and **Jack Urban**, will handle sales and distribution of Modco cutting tools in northeastern and southwestern Ohio respectively.

Standard Tool Co., Cleveland, Ohio, has announced the appointment of **Frederick H. Schuman** as Detroit district manager with headquarters at 2967 E. Grand Blvd., Detroit 2, Michigan.

— o —

John P. Roberts, aged 43, assistant general manager of The Timken Roller Bearing Co., Service Sales Division, Canton, Ohio, was killed recently in an automobile accident near Spruce Pine, North Carolina, while calling on accounts in the Atlanta territory.

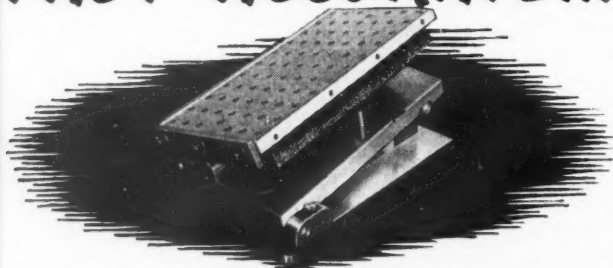
— o —

S. A. Angotti has been appointed assistant secretary for the Landis Tool Co., Waynesboro, Pa. Mr. Angotti was formerly director of industrial relations at Fairchild Aircraft Division, Hagerstown, Maryland.

— o —

John C. Ewer has been appointed managing director of Norton Grinding Wheel Company, Ltd., Welwyn Garden City, Herts, England. Mr. Ewer has served as assistant general manager of the English plant since 1950.

FAST-ACCURATE...



ANGULAR INSPECTION SET-UPS



SEND FOR
CATALOG

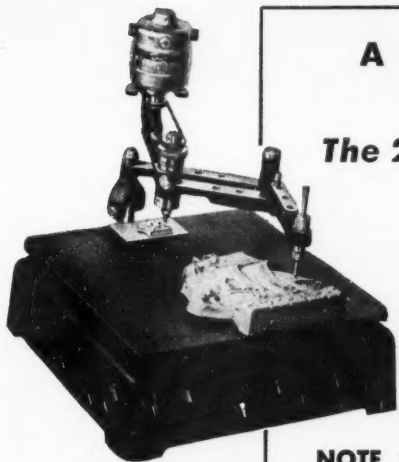
Now angular inspection set-ups as accurate as the measuring instruments used can be made in a few moments. Any angle, single or compound, is set up by inserting standard gauge blocks between the Sine-Plate plates. Proper size blocks are indicated for all angles in table supplied. Saves hours of set-up time, guarantees accurate inspection. In two sizes; also magnetic models for machining operations.



OMER E. Robbins COMPANY

Manufacturers of the MAGNA-SINE and Other Precision Tools

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INSTRUMENT CO.**
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The 2 and 3-Dimensional

MICO

Fills the long-felt need for a portable, inexpensive and dependably accurate machine for making small dies, molds, templates, etc. Extremely simple to operate.

NOTE THESE SUPERIOR FEATURES

- Engraves 2 or 3 dimensions.
- Pantograph permits 4 reduction ratios.
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- Entire spindle assembly removable to facilitate cutter grinding.
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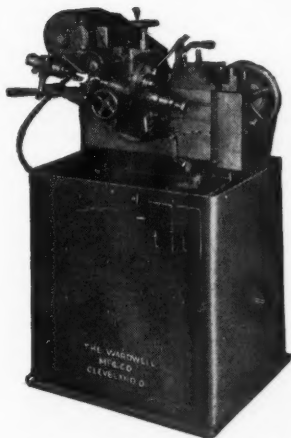
Sharpens Taps, Saws grinds straight flutes

A versatile straight flute grinder that will:

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- b) Sharpen Saws in Gangs
- c) Sharpen Reamers
- d) Grinds straight flutes from solid
- e) Spiral points
- f) Sharpen milling cutters, Woodruff key cutters

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no special skill needed!**

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Wardwell Manufacturing Co., 3166 Fulton Rd., Cleveland 9, O.



WARDWELL
Maker of largest line of
saw and tool sharpening machines

Metal-Working News in Brief

Robert S. Strawsburg has been appointed district manager of the Buffalo office of the Warner & Swasey Co., Cleveland Ohio, machine tool manufacturer. Mr. Strawsburg had been resident field engineer for the company with headquarters in Paris since 1948, returning in January of this year to the Warner & Swasey office at East Orange, New Jersey.

Lienhard & Co., La-Chaux-de-Fonds, Switzerland, manufacturer of high precision engraving machines, pantographs, and similar equipment, has appointed **Carl Hirschmann Co.**, 30 Park Ave., Manhasset, N. Y., as exclusive U. S. representative for its line of machinery.

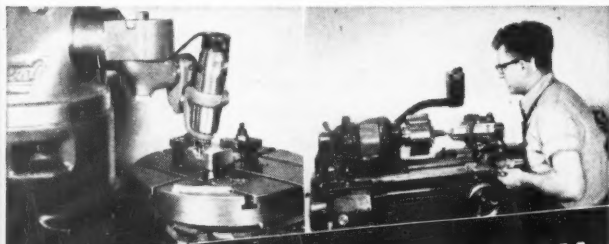
— o —

Olavi J. Warpula has been appointed demonstrator for the Grinding Machine Division of Norton Co., Worcester,

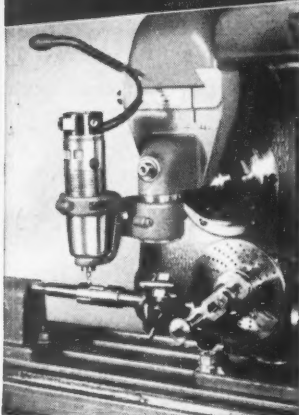
Mass., and will be assigned to the Norton Detroit office, replacing **George B. Taft**, who has retired. Mr. Warpula has been employed in the Worcester plant 17 years, spending 13 of them in the Grinding Machine Division.

— o —

The appointment of **John F. Spaulding** as sales manager of the Black & Decker Mfg. Co., Towson, Md., has been announced by **Alonzo G. Decker**, president. In his new capacity, Mr. Spaulding will supervise the sales of Black & Decker and Home-Utility tools to distributors in the United States and Canada.



**LOWEST COST PRECISION
FOR TOOL ROOM AND PRODUCTION**



ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!

Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. 1/2 HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters. PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.

Write **FOR CATALOG**

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PRECISE GRINDER-MILLERS



END MILLS and HOLDERS — by Reltool

Precision processed of finest high speed tool steel, and scientifically heat treated for long cutting life . . . Reltool End Mills are famous for long cutting life. Available in single- and double-end types, in small and large diameters, with 2, 3, and 4 flutes, with straight or ball ends, in over 1000 stock sizes.



• RELTOOL END MILL HOLDERS are made in both Tang and Draw Bar Style, and with Morse or Brown & Sharpe Taper. Sizes over $\frac{3}{4}$ " have Dual Set Screw. For complete list of sizes and prices see Reltool Catalog No. 50 and latest Discount Sheet.



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Buy KIPP AIR GRINDERS Because

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind — not just rub. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

MODEL JA
50,000 R. P. M.

\$42⁰⁰

IN U. S. A.



Weight 12 ounces;
length 6 $\frac{3}{4}$ inches;
chuck size $\frac{1}{8}$ inch.
Wheel guard re-
moved for better
illustration.

MADISON-KIPP CORP.
208 Waubesa St., Madison, Wis., U. S. A.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

Metal-Working News in Brief

E. O. Boshell, chairman of the board and president of Westinghouse Air Brake Co., Wilmerding, Pa., has announced the appointment of **W. C. Landis**, vice president, as general manager of the Air Brake Division of the company with responsibility for the operations and earnings of that division, which operates plants in Wilmer-

ding, Pa., and Emeryville, Calif. In addition, **A. M. Wiggins**, vice president, has been appointed general manager of the Union Switch and Signal Division with similar responsibilities for the Swissvale, Pennsylvania, operations.

— o —

The Cleveland Grinding Machine Company, formerly located at 6514 St. Clair Ave., Cleveland 3, Ohio, has moved

to greatly enlarged quarters at 1643 Eddy Rd., Cleveland 12, Ohio. Officers are: **George Banke**, president; **F. D. Beyerle**, vice president; **Earle A. Malm**, secretary; **M. G. Horvath**, sales manager; **John Koppitch**, chief engineer.

— o —

The Timken Roller Bearing Co., Canton 6, Ohio, has announced the appointment of **George T. Humphrey, Jr.**, to the post of assistant general manager of the Service Sales Division. Mr. Humphrey was previously assistant branch manager of the Service Sales Division of Dallas, Texas.

Staples QUALITY is Proven on the Job!

The superior quality of Staples Carbide-Tipped Expansion Reamers and other circular cutting tools shows up on the production line, where it pays off.

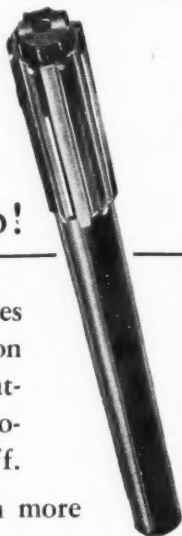
Staples quality pays off in more holes per hour, close tolerances, precision results, longer tool life. Put Staples Tools to the test in your own production and compare.

Tell us your requirements, and our engineers will gladly make recommendations.


THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio
Distributors in Major Cities

Staples CARBIDE-TIPPED CUTTING TOOLS

A complete line of Circular Carbide-Tipped Cutting Tools
Expansion Reamers — Special Tools



**Micro
Supreme**
**LAY-OUT AND
IDENTIFICATION DYE**



13 COLORS

For Tool, Die, Pattern or Template layout on metal . . . Quick identification of bar stock, sheet, strips or parts . . . Shows up in sharp relief—dries instantly . . . Write for sample and circular on company letterhead.

**MICHIGAN CHROME &
CHEMICAL COMPANY**
6340 E. Jefferson Ave. • Detroit 7, Mich.

Preloaded Precision Bearings for Spindles

MOREY 12M
HIGH-SPEED
**VERTICAL
PROFILER
and MILLER**



Two spindle or single spindle

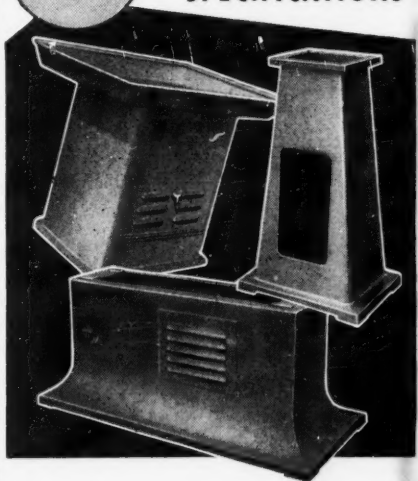
Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.

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Fabricated Machine Bases lend themselves to efficient, modern design and utilize the economies of welded steel. By reappraising your products for steel, you can initiate many cost-cutting opportunities in manufacturing because:

STEEL COSTS LESS—Pound for pound you can buy steel for less than cast iron at the cupola.

STEEL DESIGN USES LESS MATERIAL—Steel is three times stronger than iron and fabricated units have all the inherent strength and toughness to withstand shock, strain and vibration.

MANUFACTURING COSTS ARE LESS—Fabricated Bases adapt themselves to design, improvements and changes at any time with the minimum of cost.

Send blueprints to Littleford. See how Fabricated Bases can save you money.



LITTLEFORD

LITTLEFORD BROS., INC.
433 E. Pearl Street, Cincinnati 2, Ohio

Metal-Working News in Brief

Gunnar Palmgren has been elected a vice president of SKF Industries, Inc., Philadelphia, Pa., producer of ball and roller bearings. Mr. Palmgren, who will be in charge of the company's engineering and research, has been with SKF for 32 years and was assistant vice president and chief engineer prior to his promotion.

The appointment of **Elmer Eugene Hightower** to the Detroit sales staff of the Lapeer Manufacturing Company, producer of toggle-action clamping devices, has been announced by James Harrington, president of the company.

— o —

Formation of a special department to handle a vast increase in the number of military contracts has been announced by Bausch & Lomb Optical Co., Rochester, N. Y. **Kenneth E. Reynolds** will head the new Defense Contract Department.

— o —

Paul E. Wilson, 2636 S. Michigan Ave., Chicago 16, Ill., has been appointed exclusive representative in the Chicago and northern Illinois territory for the line of air and hydraulic cylinders produced by the Hydro-Line Mfg. Co., Rockford, Illinois.

— o —

Rudolph J. Lesnik has been appointed chief engineer of the Gorham Tool Co., Detroit, Mich., manufacturer of cutting tools. Mr. Lesnik joined the Gorham Tool Co. as a draftsman in 1942.

ARROW TOOL & REAMER CO., ESTABLISHED 1916

A COMPLETE LINE OF "Fascut" END MILLS

Including
THE POPULAR
3 FLUTE!



The recognized advantages of the three fluted end mills have made this tool one of the leaders in the complete line of Arrow "Fascut" End Mills.

All Arrow End Mills are precision made tools for precision and production work. Over 34 years of experience in the manufacture of types of rotary cutting tools assures users of Arrow products both quality and economy.

ARROW also manufactures a complete line of
STANDARD REAMERS • CARBIDES • SPECIAL TOOLS

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STRAP CLAMPS
SURE GRIP STEP BLOCKS
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CAMS

Our ROWBOTTOM cam cutting facilities are at your disposal for your cam requirements.

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JUST OFF THE PRESS!

Completely New
 700 Pages, 450 Illustrations

Sections on:

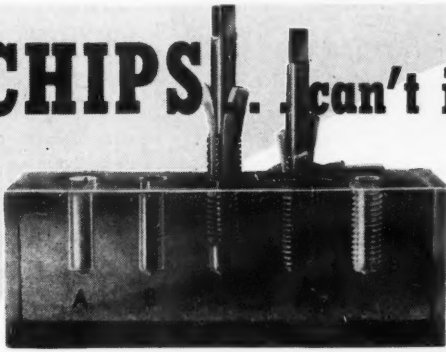
- Easy methods of computing press jobs •
- How to select the proper type of press •
- Useful engineering tables •
- Die illustrations •
- Glossary of terms used in the pressed metal industry.

Plus a complete service section covering all types of Bliss presses, old and new. \$7.50

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 Rush me a copy of the Bliss Power Press Handbook

I am enclosing \$7.50 Bill me

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TAP-CARTRIDGES
 simplify blind hole tapping

- Very economical
- Saves time and labor
- Eliminates torn threads
- Increases tap life 5 to 10 times
- No cleaning-out operation required
- Facilitates thread-cutting to bottom of hole
- Available for tap sizes from No. 6 up and for any depth of drilled hole

Hard wax TAP-CARTRIDGE is dropped into drilled hole: hole is tapped through TAP-CARTRIDGE: chips are imbedded in wax and forced out of hole. Chip interference in blind hole tapping is ended.

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THE TAP-CARTRIDGE CO.
 1638 CENTRAL PARKWAY, CINCINNATI 10, OHIO

Book reviews

Quality Control Handbook. Edited by J. M. Juran. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. 800 pages. Illustrated.

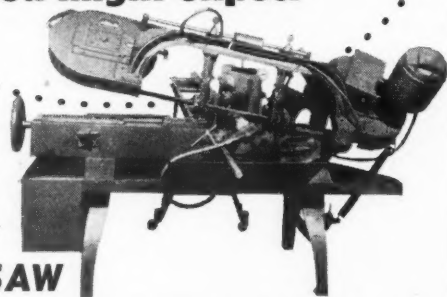
Cloth binding, board covers. Price, \$10.00.

The entire quality control function in industry is realistically treated in this handbook. Formulas, data, record forms—all tools of proven value for assuring effective production—have been included by the specialists who contributed material. Simple analyses of quality-control problems that have been met and solved in actual practice

afford specific answers for executives, engineers, and supervisors who are desirous of achieving better quality at lower cost.

This comprehensive treatment of industry's quality-control know-how takes up Economics of Quality; Specifications of Quality; Acceptance, Control and Assurance of Quality; Paperwork and Record-keeping; and Statistical Methods. There are also sections devoted to quality-control applications for specific processes and products such as Chemicals, Textiles, Aircraft, Vacuum Tubes, Vendor Inspection and Screw Machine Operations.

**Get the advantages of
AUTOMATIC BAR
STOCK CUT-OFF
at a fraction of the cost
you might expect**



**with a
WELLS SAW
and WELLS-O-BAR Feed Master**

A set-up for automatic repetitive cutting need not be prohibitively expensive. By combining a Wells Metal Cutting Band Saw and a Wells-O-Bar Feed Master you can automatically cut any quantity of identical lengths of bar stock with a modest investment. See your Wells Dealer for complete information or write direct.

Wells saws

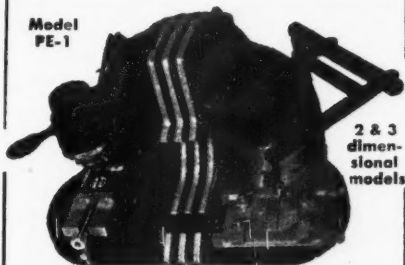
Wells

Products by Wells are Practical

**METAL CUTTING
BAND SAWS**

WELLS MANUFACTURING CORPORATION
808 TYLER ST. • THREE RIVERS, MICH

Model
PE-1



2 & 3
dimensional
models

**Variable Ratio Pantographs,
Pantograph Controlled,
Profiling Vertical Millers.**

For Contour Milling, Profiling, Intricate Cams, Calibrating, Die and Mold making. Engraves on curved surfaces without special templates, with smooth lines in any design, number, letter; on iron, brass, copper, aluminum, soft steels and all plastics • Drills a series of holes • Increases accuracy and production • Etches glass and similar items • For information and prices write Dept. M.

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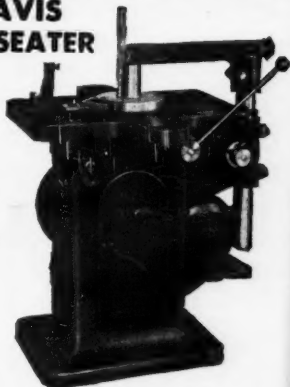
Florida Hill Rd.,

Ridgefield, Conn.

**Why Use A Shaper
to cut Keyways when a
DAVIS
KEYSEATER**

will
do the
job so
much
quicker
and
better?

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for
Circular



DAVIS KEYSEATER CO.

Exchange and Glasgow Sts.
ROCHESTER, N. Y.



Send parts
for free
grooving and
production
estimate.

**For Simplicity In
OIL GROOVING!**

The FISCHER No. 1 Oil Groover cuts a wide variety of grooves in bearings up to 8" in length and up to 5" inside diameter. A few simple settings permit you to cut continuous, relieved, straight or spiral grooves at any angle from parallel to perpendicular to the work. Grooves may also be cut in shafts, housings, etc.

This machine will slash grooving time and deliver continuous profitable production in your shop. It will pay to find out what it can do on your grooving jobs.

Write for Catalog.

Fischer Machine Co.

Established 1900

316 N. ELEVENTH ST. — PHILADELPHIA 7, PA.

Descriptive Geometry. By Harold Bartlett Howe. Published by The Ronald Press Company, 15 E. 26th St., New York 10, N. Y. 332 pages, 6 x 9 inches. 398 illustrations. Cloth binding, board covers. Price \$4.00.

Designed for use in undergraduate courses, this textbook employs the direct-method approach instead of the earlier plane-trace method. This pro-

cedure is said to make the theory of the subject more interesting and to enable the student to master the content more readily.

To effect the attainment of proficiency in teaching the subject, the book makes use of pictorial sketches which stimulate the student's capacity to perceive and visualize and require him to express his space conceptions in picture

form. His ability to sketch space pictures is gradually built up in steps that progress from simple fundamentals to more complicated combinations. The plan affords a clear picture of principles in a short time, and he is thus able to achieve a broad coverage of the subject. It develops his ability to make sketches, something that is highly important in view of the emphasis that industry now places upon this qualification.

One aspect of the teaching of descriptive geometry is the application of theory to the solution of practical problems. To further this end, the

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PARTS... LIKE THESE...



Valve Stem for Fuel Injection
System, Jet Propulsion Engine.
MATERIAL: Stainless Steel

Ball and Race Unit for Radar
Instrument. Lapped to No. 3
Micro Finish .0001 Accuracy
all over. MATERIAL: Nitralloy

.. ARE PRECISION-MADE by...

FULLER

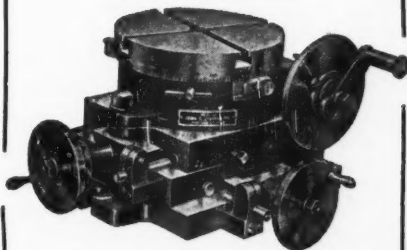
Close tolerance parts for aircraft, radar, electronics,
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accuracies to .00005. Fine finishes to No. 3 Micro. Heat
resistant and stainless steel, Nitralloy, bronze, etc.



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No. 1 COMPOUND TABLE

With 7 1/2" Dial Type Rotary
Table Mounted



We also make a No. 2 Size for 12"
Rotary Table. Can be had without
Rotary Table.

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Rotary Tables • Multiple Spindle Index
Centers • Vises • Screw Machines
Screw Head Slotters

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No. 4B PUNCH

Capacity—1/4" hole thru 1/16 gage iron.
Length—8 1/2"; Depth of throat—2".
Weight—3 lbs.

Stock size punches—1/16" to 9/32" by 1/64".
Can be had complete in metal box as shown
or in cardboard carton.

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Get Better Production from PRECISION CHECKING



Pump Rotors Checked to Within .0005" on Sundstrand Bench Center

Simplify assembly, lower spoilage and get better production from this modern Sundstrand Bench Center. For instance, this manufacturer of pumps checks the concentricity of the O.D. of the pump rotors within .0005" with the spline and checks side runout with the spline to within .0005". You'll check work between centers easier, faster and within limits of .0001" on this improved Sundstrand Bench Center.

"One-hand control" over all movable elements leaves the operator's other hand free to control rotation of the part being checked. Either headstock or tailstock can be unclamped, positioned and locked in place with a single hand operating the top lever. Investigate this bench center today.

Complete Range as Follows:

6" x 18"	12" x 36"	12" x 60"
6" x 36"	12" x 48"	12" x 72"

FREE Additional Data

covering complete specifications and additional features is contained in this bulletin. Write for your copy today. Ask for data sheet No. 514.



Sundstrand Machine Tool Co.

2539 Eleventh St., Rockford, Ill., U.S.A.

book presents many engineering problems. As basic visualization training in structure and machine design, special emphasis is placed on vectors, and particularly on their use in finding stresses in planar and noncoplanar structures and for the representation of moments. A portion of the text is devoted to an explanation of the principles of perspective drawing by means of picture sketches.

Directory of Steel Foundries. Published by Steel Founders' Society of America, 920 Midland Bldg., Cleveland 15, Ohio. 208 pages. Price \$10.00.

The most up-to-date information available on steel foundries in the United States, Canada, and Mexico is said to be incorporated in this helpful reference volume which includes separate sections containing detailed data on individual foundries in each of the

three countries. Supplementing complete lists of all such steel casting facilities are informational breakdowns on personnel, production equipment, types of castings produced, capacities, trade marks, and related data.

Producers of heat and corrosion-resistant castings and high manganese, investment mold, and tool steel castings are listed along with all known producers of carbon and alloy steel castings of varied types. Of special usefulness is a concluding section comprising a comprehensive index of the U. S. steel foundries, listed alphabetically by states.

Less Labor— More Work—Bigger Profits

QUADRILL & QUAD-TAPPER

**Increase
Production
33%**

**Fits
Directly
on Drill
Press**



- Uses up to 4 drills and taper on single press
- Saves moving of jig from one press to another
- Drills to full capacity of press
- Costs less than a drill press — does the work of 4
- A thoroughly PROVEN tool. Thousands in use.

Investigate this important work-saver. Write for literature today.

CHICAGO QUADRILL CO.

4526 W. ADDISON ST. • CHICAGO 41, ILL.

Aluminum Production Film

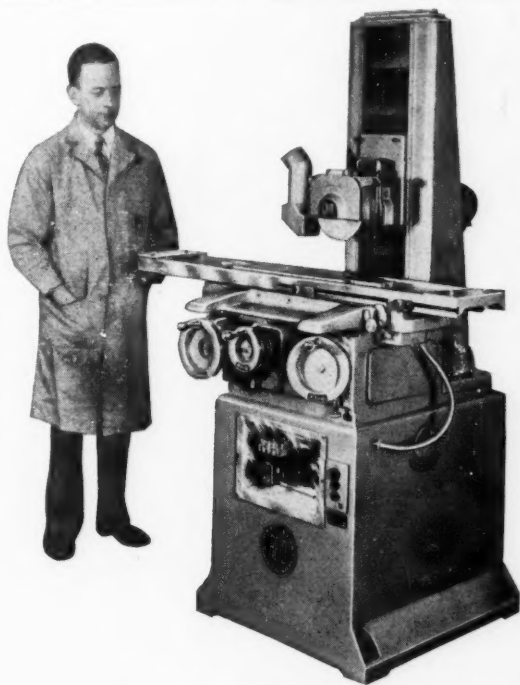
Reynolds Metals Company has announced that its 16 mm. sound motion picture film, "Pigs and Progress," showing aluminum production in full color has been recently revised so as to bring it up-to-date with the rapidly advancing uses for aluminum.

The film presents in simple language a complete non-technical story of aluminum. Beginning with the mining of bauxite in Reynolds' own mines, the scenes shift to Reynolds' large alumina mill plant at Hurricane Creek, Arkansas, where the bauxite is converted into alumina, a pure white granular material resembling sugar. The alumina is then shown being electrically reduced at the huge Jones Mill, Arkansas reduction plant to metallic aluminum. Also shown are the mill operations involved in converting aluminum ingot to such forms as sheet, plate, foil, wire, rod, bar, electric cable, aluminum powders and pastes, rolled and extruded shapes.

In addition to the production of aluminum, the film reveals how it is fabricated into many items such as re-

frigerator parts, deep-drawn washing machine tubs, television antennae, coffee makers, tumblers, and the like. Aluminum foil is shown rolling from new high speed mills at Reynolds. The production of aluminum pigment for use in paints and other protective coatings is also shown.

The film requires 26 minutes for showing. Prints of the film with sound track are available for loan without charge by writing to the Motion Picture Department, Reynolds Metals Co., 2500 S. Third St., Louisville 1, Kentucky.



REID SURFACE GRINDER MODEL 618V
WITH VARIABLE TABLE SPEED - 12 to 35 Feet Per Minute

REID BROTHERS COMPANY, INC.
BEVERLY - MASSACHUSETTS

New Shop Equipment

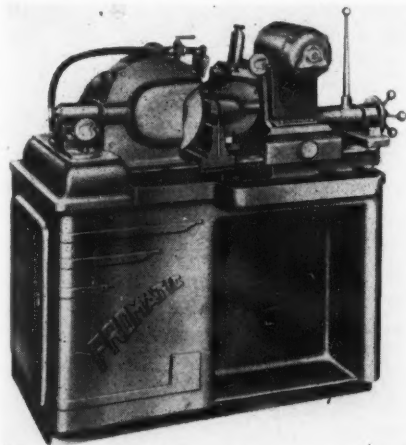
Machine Centerless Grinds Work up to 1 1/4 Inches in Diameter

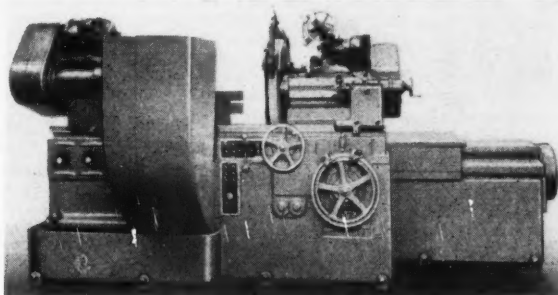
Designated as the "Promatic" No. 1, a compact centerless grinder for centerless grinding jobs of small to medium size has been announced by Diversified Metal Products Co., 5125 Alcoa Ave., Los Angeles 58, Calif. All castings of the machine are normalized and made of high-grade semi-steel with unusually high percentage of nickel content. Main castings have "built-in" sturdiness, and both spindle housings are of unusual size to ensure vibrationless operation. The spindles are made of extra heavy duty alloy steel and are mounted in pre-loaded precision anti-friction bearings.

Specifications of the machine are as follows: capacity, 1 1/4-inch maximum diameter x 4-inch face; regulating wheel, 7-inch diameter x 4-inch face; main stock diameter; grinding wheel, 14-inch spindle speed, 1,600 r.p.m.; grinding wheel motor, 2 h.p. 1,800 r.p.m. 220/440-volt 60-cycle; regulating wheel motor, 1/4 h.p. Vari-drive; regulating wheel speed, 35 to 350 r.p.m.; overall length, 48 inches; overall height, 54 inches; overall width, 35 inches; shipping weight, approximately 2,800 lb. (less main motor and grinding wheels).

Standard equipment of the machine includes a built-in coolant reservoir with removable settling basin; coolant pump with 1/4 h.p. motor and all necessary fittings, strainer screens, outlet valves, and connections; wheel guards, combination straight and contour wheel dressing de-

"Promatic" No. 1 Centerless Grinding Machine





Norton Aircraft Strut Grinder

vice (less diamonds and nibs); $\frac{1}{4}$ h.p. Vari-drive regulating wheel motor and controls; three-groove main motor sheave bored for 1-inch shaft with $\frac{1}{4}$ x $\frac{1}{8}$ -inch keyway; and all necessary V-belts.

type. A convenient means of wheel head travel control is provided by adjustable dogs on a large wheel placed on the front of the machine. A swivel table permits grinding unit and the ample proportions of the entire machine are said to assure highly dependable service. An auxiliary spindle for use on parts with projections is available on order.

Grinder Built Especially for Grinding Landing Gear Mechanism Components

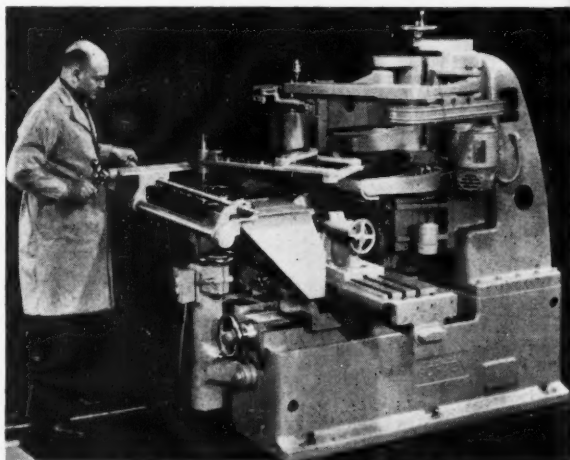
The Norton Aircraft Strut Grinder announced by Norton Co., Worcester 6, Mass., is built especially for grinding the components of landing gear mechanisms used on large planes. According to the manufacturer, the machine provides the capacities required for grinding these mechanisms which, because of irregular shape and large swing, are not readily accommodated in standard sizes of cylindrical grinders. It is arranged for a 26 or 32-inch diameter swing over the table and is available in work length capacities of 72 and 96 inches.

The Norton Strut Grinder offers a swing capacity of 80 or 86 inches by means of a gap. This gap is adjustable in width by moving a pedestal on which the headstock rests. Through the pedestal feature, the gap may be set to any desired width up to 26½ inches and is provided with a safety guard adjustable for width.

The machine is of the traveling wheel head

Machine Mills, Routes, and Engraves Completely Around Rolls and Cylinders

Product of George Gorton Machine Co., 1706 Racine St., Racine 1, Wis., the Gorton Pantographic Roll Engraver illustrated herewith is designed for accurate milling, routing, and engraving completely around cylinders and rolls. In operation, the machine accommodates rolls (ferrous or non-ferrous metal and plastic) from 6 to 12 inches in diameter and up to 40 inches long. The workpiece is held between centers as on a lathe. Movement of the tracer forward and backward automatically rotates the roll; longitudinal, left-to-right movement of the



Gorton Pantographic Roll Engraver

tracer does not rotate the roll. Thus, the cutter point is always centered over the axis of the workpiece.

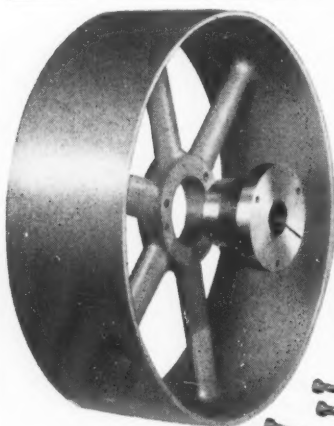
The maximum area covered by the cutter at one setting is 5 x 20 inches. A master pattern is cut in flat brass, sheet iron, zinc or sheet plastic in either sunk or relief form and twice the desired size, and is clamped to the master table at the front of the machine ready for tracing. During the tracing and cutting operation, the cutter reproduces on the roll the master design one-half size at whatever depth of cut is required. For heavy roughing cuts, a built-in manual

scanning attachment is furnished into which the tracing spindle is clamped. This attachment is manually operated by means of longitudinal and transverse feed screws which permit unusually heavy cuts with positive control in the roughing operation.

Repeating the design segment in the master in order to cover the entire roll surface is accomplished by indexing the workpiece, or roll, as each segment is completed. This operation is effected by a simple adjustment of the headstock drum. In this manner, all milling, routing, or engraving is accomplished with-

out removing or otherwise disturbing the workpiece. No gears are used in the machine. Correct speed of rotation for reproducing the master completely around rolls of any diameter within capacity of the machine is provided by a built-in compensating mechanism which is easily set for each individual roll diameter.

Other features of the machine include a precision-built heavy duty spindle, belt driven by a ½ h.p. variable speed d.c. motor which provides infinitely variable spindle speeds of from 500 to 12,000 r.p.m. If required, this speed range can be changed to meet the specific needs of the user. The roll is held on centers and is rotated automatically during the cutting operation by the headstock drive. The tailstock center floats on anti-friction bearings. Machine weighs approximately 10,650 lb. and occupies floor area of about 80 inches wide x 87 inches front to back.



SAVE WITH PYOTT QUE-DEE CAST-IRON PULLEYS

Pyott Que-Dee (quick detachable) Flat Belt Pulleys offer the same economies and time-saving advantages in assembly and field operations as Pyott Que-Dee Sheaves. The Taper-Tight Bushing, with standard keyway, slips easily over shaft. The tapered hub of the Que-Dee Pulley slides easily into position on the Taper-Tight Bushing. Three bolts pull pulley bushing and shaft into a positive powerful pull-up fit. For dismounting, the same bolts, inserted in demounting holes, act as jack screws to loosen pulley.

Immediate Delivery in popular diameters and face widths from complete factory stocks or your mill supply.

WRITE FOR CATALOG 80

PYOTT FOUNDRY & MACHINE CO.

333 NORTH SANGAMON STREET

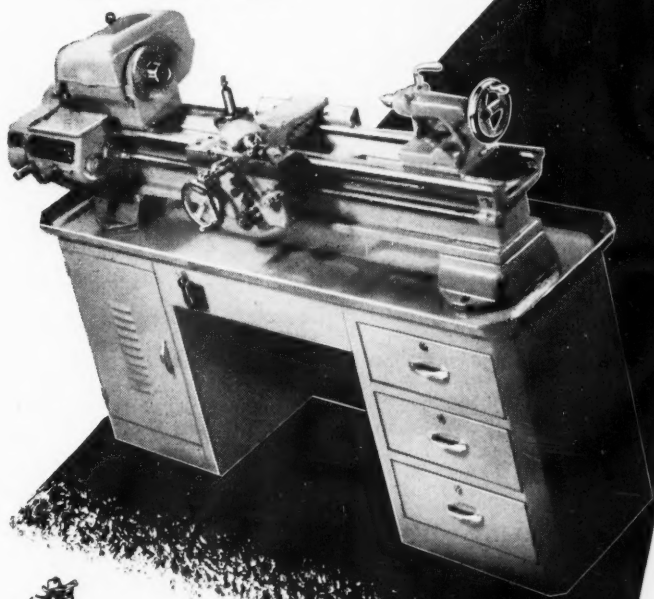
• CHICAGO 7, ILLINOIS

SHELDON

CHICAGO

A better Lathe from any angle

Judge it from any angle: for accuracy, stamina, rigidity or capacity (for size). Check its component parts—its spindle, spindle bearings, lead screw, apron, carriage, bed, gearing, or the power delivered by its drive—you will find the SHELDON Lathe a quality tool both in appearance and "under the hood".

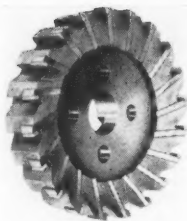


Write for
Catalog

SHELDON MACHINE CO., Inc., 4250 North Knox Ave., Chicago 41, Ill.

Face Mill Has Removable Inserts

Nelco Tool Co., Inc., Manchester, Conn., has announced a removable insert face mill which includes an unusually heavy and rigid body, positive-locking ac-



Nelco Removable Insert Face Mill

tion, and heat-treated tool steel carbide-tipped blades. Recommended for milling cast iron, steel, aluminum, brass, and bronze, the cutter is said to produce an unusually fine finish on workpieces at high rates of table feed.

Grinding Wheel Bond for Carbide Tool Sharpening

Designated as "XL," a grinding wheel bond designed especially for tungsten carbide tool sharpening has been developed by Chicago Wheel & Mfg. Co., Dept. MMS, 1101 W.



Chicago "XL"
Bonded Wheels

Shims stamped from LAMINUM® look like solid metal but actually are made up of layers of .002 or .003 inch brass or steel.



when a shim is LAMINATED here are your advantages:

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STAMPINGS

SHIM STOCK

Monroes St., Chicago 7, Ill. Available in the most popular straight and cup wheel sizes and with steel backs. "XL" Bonded Wheels are recommended for offhand or precision grinding of carbides on milling cutters, broaches, reamers, counterbores, and other similar tools. Durable and longlasting, the Chicago "XL" bonded wheels are claimed by the manufacturer to provide for a cutting action that is both unusually cool and fast.

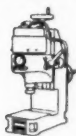
NOW! AN AIR PRESS THAT'S BUILT FOR PRODUCTION USE

Here's another Famco Cost-Cutting Machine—a compact, rugged Air Press built for high-speed production operation. Famco Air Presses are available in 20 models, 1/2 to 3 1/2-Ton capacity with electric or air controls—the product of Famco and Bendix-Westinghouse engineering.

SPECIAL FEATURES INCLUDE:

- Extra-long strokes infinitely variable from 0 to maximum.
- Semi-steel cast frame and cylinder mount; use of alloy-steel, copper tubing and steel fittings throughout.
- Frictionless (leak-proof), longer-lived cylinder requires no lubrication.
- Accurate, built-in pressure gauge.
- Ram keyed to prevent rotating.
- Infinitely variable vertical adjustment of cylinder.

OTHER MODELS AVAILABLE WITH CHOICE OF CONTROLS



Left: Single Air Control Type.



Right: Dual Air Control Type.



Left: Single Electronic Control Type.



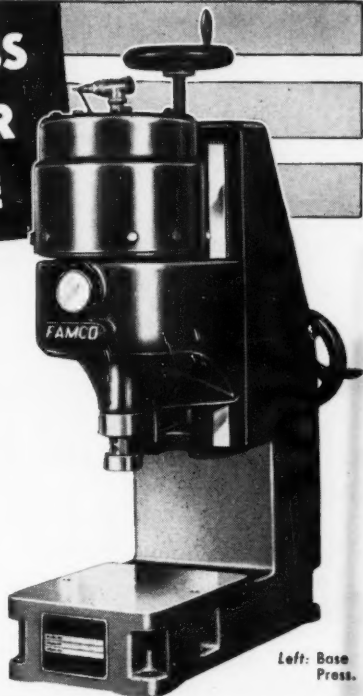
Right: Dual Electronic Control Type.

For further details on the line, write for new Famco Air Press Catalog.

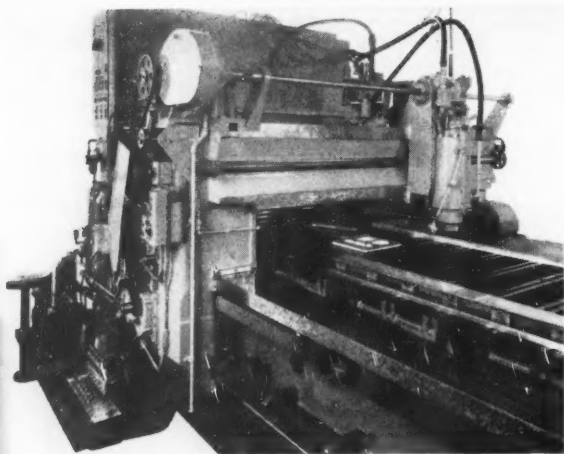
FAMCO MACHINE COMPANY • 1324 18th ST. • RACINE, WIS.

famco COST
CUTTING **machines**

**ARBOR PRESSES • DRILL PRESSES • BAND SAWS • AIR PRESSES
POWER PRESSES • FOOT PRESSES • SQUARING SHEARS**



Left: Base Press.



Onsrud InvoMill

**Power Feed Router and Skin Mill
Handles Thick Stocks of
Non-Ferrous Metals**

Onsrud Machine Works, Inc., 3900 W. Palmer St., Chicago 47, Ill., has introduced

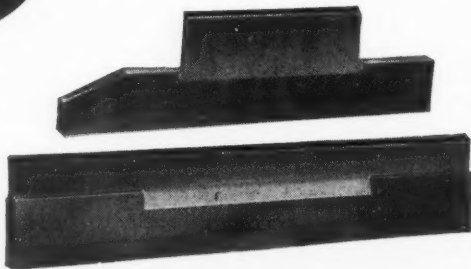
ed the Onsrud InvoMill, an automatic electronic-controlled power feed router and skin mill which is said to permit routing of unusually thick stocks of aluminum and other non-ferrous metals. Claimed to be of particular importance in the making of grids which hold gas tanks and other parts inside aircraft wings, the machine is equipped with a 30 h.p. motor which is said to supply ample power for routing aluminum stock of 1 inch or more in thickness.

The Onsrud InvoMill also acts as a dual-purpose machine, handling skin milling of large aluminum pieces used to form wings. A 40 h.p. 5,400 r.p.m. direct-driven liquid-cooled motor mounted on the crossrail is claimed to provide all the power necessary for tough milling work. Both motor and crossrail may be tilted



Standard thrufeed and in-feed work support blades available from stock. Prices on special blades quoted on receipt of prints. We retip and regrind. Let us salvage your worn blades.

**CARBIDE TIPPED
Work Support Blades
for CENTERLESS GRINDERS**



WILLEY'S CARBIDE TOOL CO.

SOLE MAKERS OF WILLEY'S METAL

1342 W. Vernor Highway

Detroit 1, Michigan

to varying degrees, providing a combination of angles without the use of sine plates. Three table widths—72, 84, and 96 inches—are available for routing or skin mill applications, with bed lengths furnished in multiples of 15-foot sections plus 7 feet for conveyor.

Method for Machining Sintered Carbides and Other Superalloys

A method of metal removal which employs the direct utilization of electrical energy for the machining of any electrically conductive material is now being made available through the Method X Corp., Affiliate of Fifth Sterling Steel & Carbide Corp., 3113 Forbes St., Pittsburgh 30, Pa. The Method X machine removes metal in a directed manner by means of an electric spark discharge which does not otherwise affect the work material's physical or chemical characteristics. The machining action depends on a mechanical effect of electricity which sets up internal mechanical stresses by the use of extremely high current densities and thereby causes the metal particles to detach themselves from the work material without resort to melting. Surface finishes of 26 microinches r.m.s. can be obtained, it is claimed. Lapping of less than 0.001 inch is said to produce any desired finish down to 0.15 micro-inch on sintered carbide. Center to center spacing of holes through the same workpiece can be controlled to approximately 0.0005

inch. Blind hole file radii can be made as small as 0.002 inch.

The equivalent of all machining operations ordinarily accomplished in metalworking such as boring, drilling, tapping, internal and external shaping and engraving by using the electrode as a cutting tool can be done expediently with the Method X, it is claimed. The machine's design is similar to a drill press with a pedestal type base, an electrode feed and control mechanism, and a remote unit power supply. The machine has a work table provided for longitudinal, lateral and vertical traverse and full rotation for work alignment. Electrode feed is automatically controlled by an Ampidyne



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Non-inflammable, odorless, non-toxic, neutral IMMUNOL added to any water in long dilutions makes a powerful solvent, rust preventive and wetting agent for all types of metal cleaning except vapor degreasing. IMMUNOL solutions replace such solvents as Stoddard Solvent, Kerosene, Carbon Tetrachloride, Mineral Spirits, etc., and are lower in cost as finished solutions.

Lighted cigarettes, sparks, open flames, open electrical circuits, etc., will not ignite IMMUNOL. Your employees can work in close contact with odorless IMMUNOL without toxic effects and can immerse their hands and arms in its solutions for indefinite periods of time without fear of skin infection, degreasing or irritation.

Parts cleaned with IMMUNOL are protected from rust by a non-oily, invisible film which need not be removed prior to additional processing and which can be painted or lacquered over with ease.

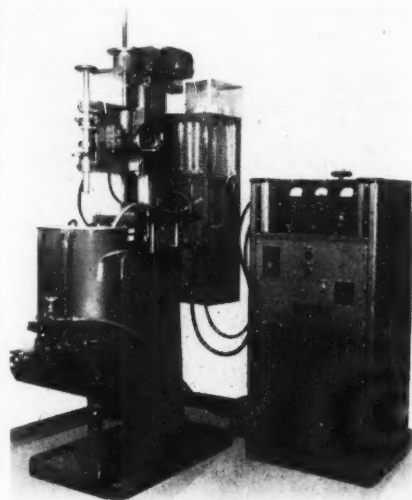


SEND FOR BOOKLET

Haas MILLER Corp.
4th & BRISTOL STS. • PHILA. 40, PA.

and associated circuits so that optimum cutting speeds for a given cutting condition are maintained. A dielectric fluid is used to enclose the cutting operation. The purpose of the work submersion in the fluid is to build up electrical resistance so that the energy storage devices in the machine may be fully charged prior to discharge, and also to flush the loosened particles from the work area.

Electrodes are made of a highly conductive, easily machined material, such as brass, although other conducting materials may be used. They are usually ma-



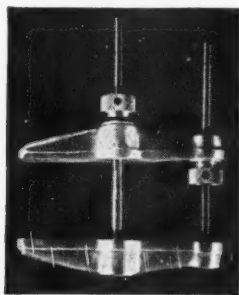
Method X Metal-Working Machine

chined to a negative of the shape to be produced when the machining operation can be performed with the head moving in a vertical direction. When the machine is required to revolve, or the work table traverse, for an internal irregular contour, an electrode of brass wire bent to the necessary working angle is all that is required since the tool does not make physical contact with the work.

Vise Action Clamp Is Made of High Strength Aluminum Alloy

For toolmakers, inspectors, general machine workers, fabricators, and others, C. B. Teeter, 4470 Oakenwald Ave., Chicago 15, Ill., is offering the Monarch Vise Action Clamp illustrated herewith, which is

made of high strength aluminum alloy that is said to assure a tensile strength in excess of 40,000 lb. The jaws measure 1 inch wide x 3 inches to the adjusting screws. Made of special steel rod, these



Monarch Vise Action Clamp

screws are imbedded permanently in the lower jaw, the upper jaw being free for adjustment in clamping of objects up to 4½ inches thick. The screws have threads of unusual smoothness to facilitate spinning of the knurled nuts for tightening the clamp.

Die Steel Now Available in 36-Inch Length Bars

According to an announcement made by Simonds Saw & Steel Co., Dept. A, 470 Main St., Fitchburg, Mass., Simonds "Red Streak" Flat Ground Die Steel is now available in 36-inch length bars in 35 standard stock sizes from ½ x 2 inches up to 1½ x 10 inches. These sizes are in addition to the regular 18-inch length bars furnished in 159 stock sizes. The longer bars are slightly over 36-inch length to allow for several saw cuts.

Made of oil-hardening non-deforming

type die steel, Simonds Red Streak Die Steel is uniformly annealed and is said to be easy to saw, file, and machine. Accurately ground to a thickness limit of ± 0.001 inch, all bars have an extra smooth surface finish that is claimed to be especially suited for layout work. Edges and ends are said to be square, parallel, and accurate to dimension. Due to the wide hardening range (1,450 to 1,540 deg. F.) of the steel, consistently uniform results with all thicknesses with a minimum of shrinkage or warping are claimed to be assured with even the simplest heat-treating equipment.



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Exclusive Duplicating Process
ONE CAM OR A QUANTITY

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The IMPROVED Compound Lever Shears

ALL ALLOY
FULLY
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Two Sizes

PORTABLE

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.

BREMIL MFG. CO.

1400 Pittsburgh Ave., Erie, Pa.

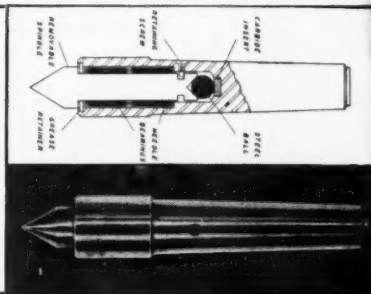
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WEE LIVE CENTERS

Exclusive SMALL HEAD design of WEE Live Centers combines live center advantages with size and accuracy of dead centers. 30 to 40% less overhang means deeper cuts, faster speeds, no chatter. Used by hundreds of leading concerns. No. 2 M.T., \$21.00. Request complete price list.

Write direct, if distributor cannot supply you.

HERBERT CROSS & SON, Bala-Cynwyd, Pa.

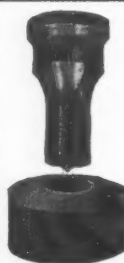


Midget Impact Press Handles Variety of Operations

Designated as the Benoit Mighty Midget Impact Press, a solenoid-operated bench press for staking, cutting, crimping, riveting, clinching, marking, trimming, stamping, blanking, swaging, perforating, assembling, and other operations is now being marketed by Peacock Metal Production, Inc., Dept. M, 752 Hyde Park Ave., Hyde Park 36, Mass. The machine is designed to develop a 1-ton impact on a 110-volt line every 1/6 second if desired. It is activated by a micro-switch



Benoit Mighty Midget Impact Press



PUNCHES and DIES TO FIT MOST MAKES OF PUNCH MACHINES

Large range of round, square, flat, and oval sizes are carried in stock for immediate shipment. Special tools are made to order.

Catalog Sheets Available.

T. H. Lewthwaite Mach. Co.
317 East 47th St., New York 17

located under the right side of the base and arranged so that the plunger will not repeat. An adjustable screw is also provided for controlling depth.

If desired, the press can be furnished with a foot switch as extra equipment. Moreover, it is possible to equip the machine with two switches for safety purposes so that the operator must use both hands to complete the operating cycle. A Variac control unit which controls the amount of impact is optional.

MAKE 3 HAMMERS



AT ONCE

Mold your own
Lead Hammers
on a PRODUCTION SCALE
with a Shur-Grip
Handle and

Cook Production Mold. Write
for Circular.

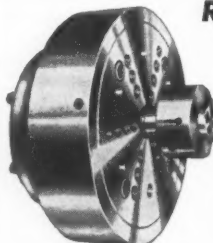
Vises, Hammer Molds, Handles

LAWRENCE H. COOK, INC.

67 Massasoit Ave. E. Providence 14, R. I.

Wet Belt Grinder Features Power Reciprocating Table

Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo, Mich., has introduced a heavy duty 8-inch wet abrasive belt grinder, designated as the Model V8-WP, which is designed for production finishing and surfacing ferrous, ceramic, and plastic parts. Thin sectioned parts, it is claimed, can be finished without danger of distortion.



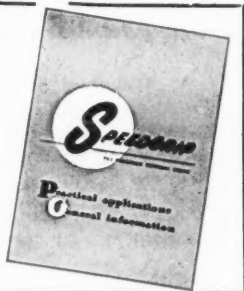
Revolutionary Processes

are always being developed. At first we are skeptical of them, but gradually we observe and consider their merits. Eventually we accept the benefits they have to offer.

So it was with SPEEDGRIP PRECISION INTERNAL CHUCKS. Today they are playing a leading role in leading industries of America. Send for your copy of the new SPEEDGRIP MANUAL today.

SPEEDGRIP CHUCK, INC.

820 NORTH WARD STREET
ELKHART, INDIANA



Simplify

LARGE
HOLE

Tapping

with the New Procunier TAP KING

This lightweight, heavy duty tapping attachment was designed especially for difficult large hole tapping. Rugged, dependable, with a super-top capacity of $\frac{3}{8}$ " to 1" in steel and up to $1\frac{1}{8}$ " in softer materials, the Tap King has been establishing production records. Many users report 50% production increases on large hole tap jobs and costly parts spoilage practically eliminated! And these are not isolated cases! Other users claim more **spectacular** daily production gains. Production men report amazing savings in parts spoilage and consistent, more accurate maintenance of uniform tap depth—even on large **blind hole** tapping jobs! Check these unique features:

Exclusive 17 tooth spline drive from clutch to tap holder spindle, gives smooth, powerful drive, increases tapping accuracy and reduces strain, wear and vibration; new, sensitive yet powerful friction clutch drives tap smoothly, with finger tip control—drastically reducing operator fatigue resulting in more work in less time with less effort; ball and needle bearings assure longer, trouble-free life; reverse speed is twice forward speed; simplified oiling system; aluminum housing; PLUS many other unusual features.

Write TODAY for circular giving full details and specifications showing how you can adapt this tapping machine to fit **your** particular needs.

PROCUNIER SAFETY CHUCK CO.,
12 S. Clinton St., Chicago 6, Ill. Dept. 11

Gentlemen: Please send me full details on the new Procunier "TAP KING" Heavy Duty Tapping Attachment.

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NEW! LARGE!

"TRU-GRIP" Tap Holder
Makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks. Lighter, smaller in diameter, it drives the tap by the square, holds it true by the round.

Procunier
Safety Chuck Company
16 S. CLINTON ST. CHICAGO 6, ILL.



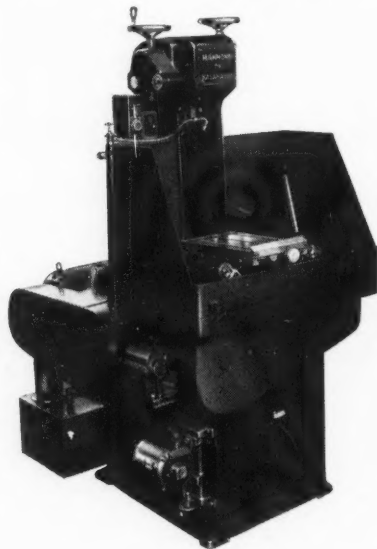
Especially written for safety inspectors and maintenance supervisors directly responsible for the safety of press operators, "Power Press Protection" is yours for the asking. Contains valuable information on the maintenance and safe operation of power presses. Send for your copy today.



**JUNKIN SAFETY
APPLIANCE CO.**

101 S. Floyd
LOUISVILLE 8, KENTUCKY

The machine features a power reciprocating table with tilting workholder, and a water-cooled belt platen. The power reciprocating table travels on hardened steel ball bearing ways and is driven by a V-belt from a small motor to a reducing gear and crank disc. Table travel is adjustable from 0 to 8 inches, and the stroke speed back and forth across the abrasive belt can be varied to suit the work being performed. The construction of the tilting workholder enables work to be quick-



Hammond Model V8-WP Wet Abrasive Belt Grinder

ly and easily brought to loading, unloading, and grinding positions.

Features of the water-cooled platen make it possible for the downward pull of the abrasive belt to create a continuous film of coolant between the back of the belt and the entire face of the platen. The water-cooled platen is said to eliminate distortion of both work and platen usually caused by heat.

The machine is equipped with a self-contained coolant system employing two coolant tanks with a combined capacity of 35 gallons. It can also be equipped with a plain table or manual reciprocating table and for water main connection instead of with a self-contained pump and tank unit.

midgets in size



GIANTS

in performance

With the same dependability, ruggedness and low maintenance that have built an outstanding reputation for other CP products, CP UNIVERSAL ELECTRIC DRILLS are unsurpassed for production line work.

Yet they are priced no higher than other production line drills, because they are sold direct to the user by Chicago Pneumatic, the only major company selling electric tools directly to industry.

Drill with
holespotter
attachment.



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unsurpassed
for fast work
on production
lines.

Write for
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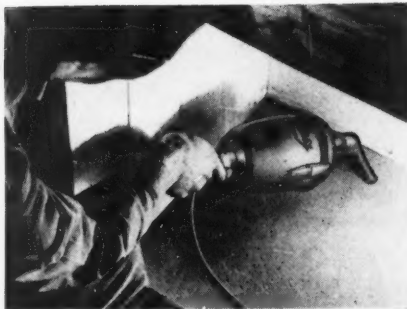
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ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Industrial Vacuum Cleaner Operates on High Pressure Compressed Air

Syntron Co., 309 Lexington Ave., Homer City, Pa., has developed a vacuum cleaner for cleaning stockbins, dusty or linty machines, and other equipment in industry. Designed to operate on air pressure of from 70 to 160 p.s.i., the unit is said to consume approximately $4\frac{1}{2}$ cubic feet of air per minute at 100 p.s.i. and is furnished complete with a 12-foot length of air hose ready for operation. The cleaner is made of aluminum and



Syntron Air Pressure Vacuum Cleaner
being used to clean stockbin

THE MURPHY PISTOL SPRAYER

INDISPENSABLE IN
ANY SHOP

No limit to work it will do. Takes place of brush and spray can for blackening mold. Blackening is driven into pores of sand or loam by air pressures. Thus it stays on and peels the casting better. Once tried, always used. Write for catalog.



Jas. A. Murphy & Co., Inc.

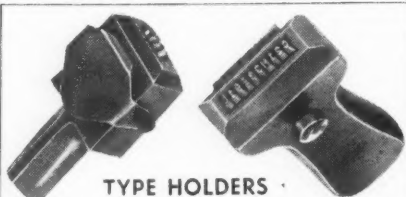
1421 High St. Hamilton, O. Hamilton Spray Gun

plastic stampings, the dirt collector bag being located inside the unit where it will not dirty or soil products or materials being cleaned and is easy to empty and clean.

Drill Unit Provides Flexibility of Setup

Commander Mfg. Co., 4224 W. Kinzie St., Chicago 24, Ill., has announced the Commander Multi-Angle Drill Unit which is designed to provide unlimited freedom of setup to simplify and reduce the cost of drilling holes at any angle. Powered by a heavy duty flexible shaft with hydraulic actuation of the full 4-inch stroke, the unit comprises a compact drill head which can be easily mounted on jigs and fixtures or built into special machines.

Quick, easy setups and infinite adjustments in drilling position, plus the long stroke of the unit, are said to provide the user with a basic drilling head that will save time, reduce piece part handling, and minimize drilling costs materially. Because of their compact design, a num-



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MARKING TOOLS MADE TO ORDER

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Cincinnati, Ohio

PArkway 3310

THE CRALEY OFFSET BORING HEADS



- Note depth of bearing.
- Tool carrying block most accurately fitted of any boring head made.
- Large graduated dial screw—easily read calibrations.
- Note minimized overhang.

- Tension screws on opposite sides and ends of block—all cutting strain thrown against solid metal.
- Nine sizes.
- 20 years of Craley experience specializing in boring heads.



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C. C. CRALEY MFG. CO.

— SHILLINGTON

PENNSYLVANIA

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OUR 77TH YEAR



**PRECISION SPINDLE
HEAVY CONSTRUCTION
GROUND LEAD SCREWS**

**SCRAPED WAYS
DUST PROTECTED**

The Excel No. 6 is designed to accurately sharpen reamers and milling cutters of a wide variety of shapes and sizes and is also adaptable to cylindrical and internal grinding.

Special attachments are available to convert the No. 6 to a multitude of uses in the tool room. Handy storage space for accessories in base.

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COVEL

OUR COMPLETE LINE INCLUDES:
Drill Grinders, Universal Cutter and Tool Grinders,
Hydraulic and Hand Feed Surface Grinders

Designed and Manufactured by

PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

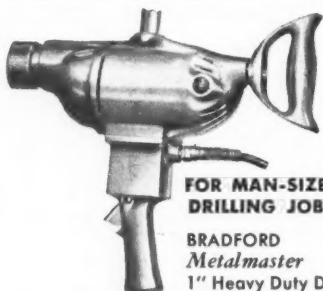
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**GRIND, BRUSH, POLISH
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BRADFORD
5" and 6"
Aerial Grinder



from ornamental iron to heavy "I" beams. Tool has excellent balance. Powerful motors develop 1/2 h.p. on 5" and 1 h.p. on 6"; has no-load speed of 3800 r.p.m. Ball bearing construction. Equipped with 5" and 6" general purpose grinding wheels. Length, 25", weight, 17 lbs.



**FOR MAN-SIZED
DRILLING JOBS!**

BRADFORD
Metalmaster
1" Heavy Duty Drill

Plenty of drilling power—for shop work or out on the job—wherever you need holes in the heaviest kinds of work. This powerful Bradford drills 1" in steel; 3" in hardwood. Does reaming to 3/4". Rugged construction. Internal collet; No. 3 Morse Taper. Pipe and swivel spade handles are detachable. 110 and 220 volt AC/DC motor.

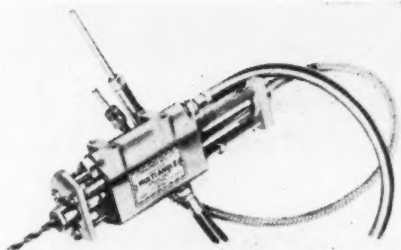
Ask your tool supplier to demonstrate these precision Bradford Tools. Write for complete information on the Bradford line of portable drills, saws, sanders, polishers; bench and pedestal buffers, grinders.

THE BRADFORD MACHINE TOOL CO.

658 Evans Street

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Precision Since 1840



Commander Multi-Angle Drill Unit

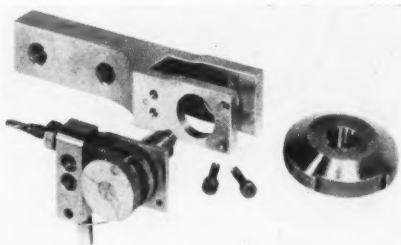
ber of Multi-Angle Units can be mounted on a jig or fixture to drill multiple holes in a single piece.

Improved Marker Eliminates Secondary Marking Operations

New Method Steel Stamps, Inc., 149 Joseph Campau St., Detroit 7, Mich., has introduced an improved model of its automatic roll marker for screw machines, and so on. Designed to eliminate secondary marking operations, the improved roll marker is notable for the simplicity and speed with which dies can be changed when required. To change the die (or rotary type holder as the case may be), it is only necessary to remove two Allen cap screws. When these are removed, the keyed die shaft and starting point adjustment screw assembly come out in one unit, releasing the die. Another die is then held in position, the shaft is slid through the die, and the holder and screws are inserted and tightened.

For shops handling a limited number of parts, solid roll dies are recommended. For plants handling many different parts, interchangeable type roll holders with a font of replaceable type are available. Various diameters of solid or type rolls are interchangeable in the same marker.

Disassembled view of New Method Improved Automatic Roll Marker



Grooved Pin Provides Simplified Method of Aligning Parts

Driv-Lok Pin Co., Sycamore, Ill., has introduced the "Lok Dowel," a precision grooved pin which is said to provide a simplified method of establishing and retaining accurate alignment between component parts of any mechanical devices, machine components, dies, jigs, and fixtures. The pin is made of cold drawn steel, centerless ground, and polished. Four parallel grooves impressed along half the length of the pin displace a carefully determined amount of metal to each side of the groove. No chip is removed.

When the pin is forced into a hole, the crests of the eight flutes are substantially forced back into the grooves; however, the resiliency of the metal sets up outward radial forces that firmly lock the grooved portion of the pin in place.

According to the manufacturer, the Lok Dowel will not slip or drop out of position under the hardest blows or continuous vibration. Disassembly or reassembly of any part is claimed to be quickly and easily effected since the grooved portion of the pin remains in place while the ungrooved end is easily slipped out of its part. Installation of the pin is described as quick and simple. The mating parts are clamped or fastened in the desired position, a slightly undersize hole is drilled to the proper depth and reamed to precise size, and the Lok Dowel is pressed or driven into place. The pin can also be made to order from drill rod or stainless steel.

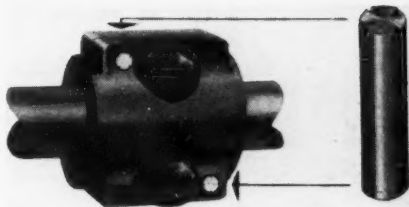


Illustration showing "Lok Dowel" Precision Grooved Pin and its use in keying the segments of a bearing firmly together in accurate alignment.

PREVENT ACCIDENTS
...use the **RIGHT TOOL**
for the job!



*a BILLINGS
will do it
better!*



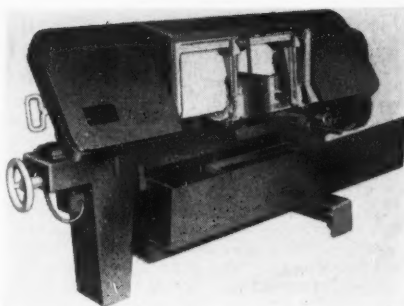
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SOCKET SETS & PARTS

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THE BILLINGS & SPENCER CO. HARTFORD 1, CONN. U.S.A.
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Band Saw Cuts Flat Metal up to 12 x 20 Inches

Designated as the "1220," a metal-cutting band saw which is designed to provide for the fast, accurate production cutting of metals up to 12 x 20 inches flat and 12 inches and over round is now being manufactured by Kalamazoo Tank & Silo Co., Machine Tool Division, 422 Harrison St., Kalamazoo, Mich. Available with or without coolant equipment, the machine features an unusually rugged construction to maintain precision; four cutting speeds from 61 to 259 f.p.m.;



Kalamazoo "1220" Metal-Cutting Band Saw



The XPEDITOR is the latest development in portable, high speed abrasive belt grinders. Instantly adjustable to any angle to give operators full view and control . . . swivels 360°. Equipped to do line contact, free belt and precision platen grinding and contour polishing. Speeds deburring and clean-up jobs; also used with jigs or fixtures or automatic feeding as a production unit . . . guaranteed to increase productivity. \$59.50 plus motor. Write,



HESTON & ANDERSON

KIRKWOOD STREET
FAIRFIELD, IOWA

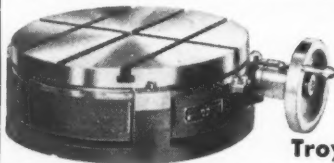
unique dash-pot mechanism to ensure controlled constant pressure during the complete cut; swivel leaf type 45-degree vise for easy adjustment of cutting angles; quick and easy blade mounting from the top; and unobstructed view of the cutting operation.

Attractively painted in special colors, the Kalamazoo "1220" Band Saw measures 87 inches long x 26 inches wide x 25½ inches high to the bed and is furnished with a 1 h.p. 220/440-volt 60-cycle three-phase motor and stock stop bar.

Machine Is Designed Especially for High Production of Discs and Heads

Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo 11, N. Y., has announced a high speed circle shear and flanger, especially designed for the high production of discs and heads. Of particular interest to manufacturers of tanks, drums, boilers, hot water heaters, containers, metal furniture, and many other sheet metal products, the machine

NO MORE COSTLY JIGS on small production jobs with TROYKE WORM WHEEL OPERATED TABLES

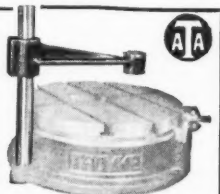


Troyke Mfg. Co.,

Sizes:

9 - 12 - 15 - 18 - 21 - 25

See your dealer or write for Catalog No. 17, fully illustrated, showing all models and applications to various work.



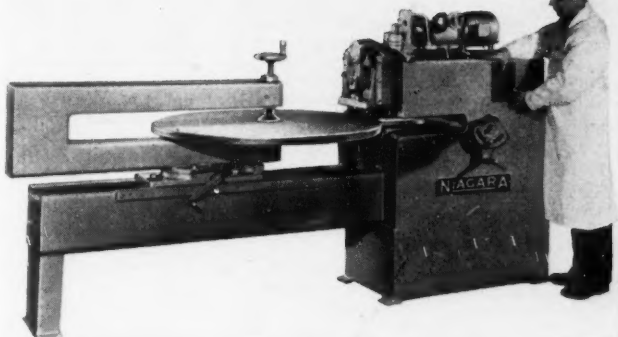
Drilling attachments can now be furnished for Worm Wheel Operated Tables.

Cincinnati 9, Ohio, U.S.A.

**Niagara Circle Shear
and Flanger**

is said to be ideally adapted for high production, as well as low or even single quantity production. The setup can be changed in a matter of minutes from one size job to another, and conversion from circle cutting to flange or vice versa is said to be accomplished in 20 to 30 minutes.

The machine is designed to shear and flange a wide range of diameters and thicknesses of material without the use of blanking, forming, or drawing dies. As a circle shear, it cuts at high speed circular discs or circular arcs of sheet metal up to 8 gauge mild steel or 12 gauge stainless steel. Discs 8 to 58 inches in diameter can be produced from square blanks, and discs as large as 75½ inches



in diameter may be cut from octagonal blanks.

As a flanger, the machine is said to turn at high speed smooth, high flanges up to 1½ inches deep from circular discs. The upper roll is moved down by power with speed adjustable to suit diameter and thickness of blank. Formed heads are claimed to be true and round and free from irregularities and to require no fur-

"MITI-MITE" No. 200

The New, Amazing Magnetic Base
"Handi-Life" for mounting on curved or
flat surfaces INSTANTLY!



ELIMINATES HAPHAZARD CUMBERSOME CLAMPING

Rayon flocked coated shield to resist heat. 25 and 40 watt bulbs included.

Flexible ball and socket swivel construction permits precision adjustment.

Base size—1"x1½". Holds rigidly wherever placed.



Magnetic pull
app. 50 lbs.

6 Ft. plastic
cord. 110 V.
AC-DC.

OTHER "MITI-MITE" UNITS

No. 100	Magnetic Base Holder for most smaller indicators.	\$ 7.50
No. 120	Combination Test Indicator Magnetic Base Holder and 4X Doubles lens Magnifier	12.00
No. 150	Duplex Magnetic Base holder for all dial indicators up to 3" dia.	15.50
No. 300	Combination of No. 100 and No. 200	15.50

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with name of your mill supply dealer

ENCO MANUFACTURING CO., Dept. 1111
4524 W. Fullerton Ave., Chicago 39, Illinois

ther trimming or finishing for average commercial work. Standard flanging rolls form a radius at the root of the flange of $\frac{3}{8}$ inch, which is appropriate for materials within the capacity of the machine. Head diameters ranging from $18\frac{1}{2}$ to $73\frac{1}{2}$ inches are said to be flanged with equal ease.

Tapping Attachment Can Be Effectively Used by Unskilled Operators

Said to enable unskilled operators to undertake the mechanical tapping of ex-

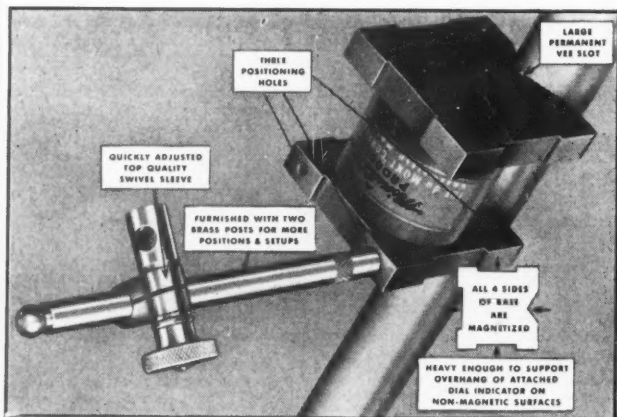
pensive components in either light metal or toughened steel without any risk of scrap, the Eric S. Johnson S.P.V. Tapping Attachment now being marketed by Eric S. Johnson Co., 230 E. Ohio St., Chicago 11, Ill., is designed to machine tap holes at a cutting speed of 300 f.p.m. and to tap blind holes in light metal on an ordinary drilling machine using spindle speeds up to 2,500 r.p.m. The attachment can be employed on drilling machines, lathes, milling machines, and other machine tools and is said to accommodate hand taps or machine taps of standard types with ground profiles.

To reduce as much as possible the friction in the axial motion of the tap relative to the tapping attachment, steel balls are provided between the body of the attachment

relative to the tapping attachment, steel balls are provided between the body of the attachment

ONLY THE *Minute Man*® MAGNETIC BASE

6 Gives You These Practical Working Advantages



Eric S. Johnson S.P.V. Tapping Attachment

MAIL THE COUPON and find out how this \$9.75 du Mont Magnetic Base for dial indicators saves you ten bucks worth of time almost every time you use it!

The du MONT CORPORATION
Greenfield, Mass.

Please mail me Folder S describing multiple uses for *Minute Man*® Magnetic Base.

Name

Company

Address

and the tap holder, thus allowing the two units to roll freely within the determined limits. The attachment is fitted with a slipping clutch which is said to prevent overloading and automatically arrest the tap when it reaches the bottom of the hole. The clutch is adjustable to allow for tapping threads of different

dimensions in widely varying materials. The design of the attachment is said to permit maximum cutting speeds to be maintained according to the material being worked.

Machine Stamps Soft Metals and Mild Steel

A numbering and lettering detail press for stamping all soft metals and also mild steel has been announced by Numberall Stamp & Tool Co., Huguenot Park, Staten Island 12, N. Y. The press is available in three models as follows: Model 141, hand operated; Model 142, air operated; Model 143, motorized. General specifications of the press are: weight, 87 lb.; bench space, 16 inches long x 10 inches wide x 12½ inches high; table adjustment, ⅝ inch up; diameter of dial, 5 inches. Dials can be furnished in character sizes of ⅛, ⅓, ⅜, ⅞, or ¼ inch.

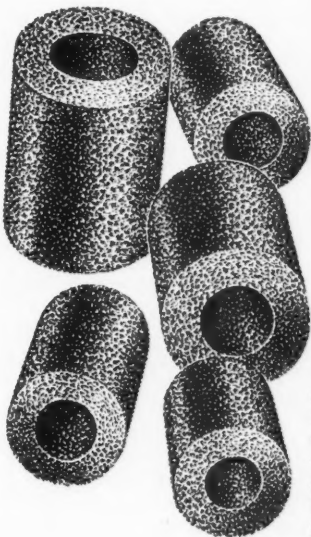
All spacing adjustments, including table release, are conveniently located at the front of press. The automatic spacer can be regulated up to ¼ inch. The spacing adjustment facilitates fitting characters into panels of name plates. The press is powerful, stamping pressure being applied by eccentric action through lever to head. Depth of impression is readily

adjusted by a knurled nut under the table. The changing of dials for different size characters is readily effected by



Numberall Numbering and Lettering Detail Press

loosening only one screw. The dials have 42 characters: letters A to Z, figures 0 to 9, &, dash —, diagonal /, small letter c, apostrophe, and period.



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Rapid Delivery

Chicago Internal Grinding Wheels produce better finishes with longer wheel life and cutting action. They're your best buy—"tailor made" to your specifications and speedily delivered.

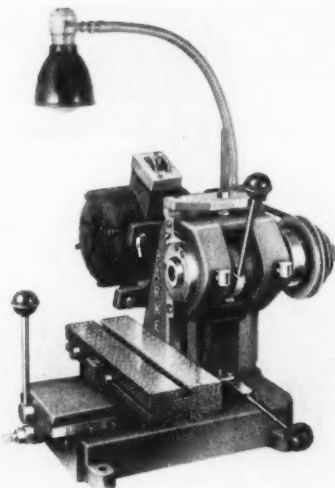
Advanced production methods assure you perfectly balanced Internal Wheels to meet rigid finishing requirements. Faster delivery... with overnight service for special jobs.

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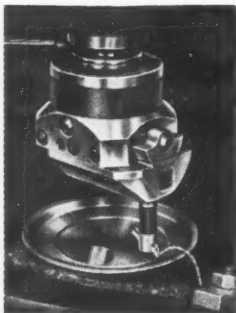
CHICAGO WHEEL & MFG. CO.
Dept. MMS, 1101 West Monroe Street
Chicago 7, Illinois

Bench Type Miller Is Designed for Rapid Production Milling

A bench type miller designed for the rapid production milling of small parts that must be held to very small tolerances has been announced by The Barker Engineering Co., 500 Green Rd., Cleveland 21, Ohio. Constructed to handle conventional milling, profiling, drilling, key-seating, end milling, slotting, and lathe type operations, such as turning, facing, boring, and recessing, the machine embodies the advantages of longitudinal table travel, transverse saddle travel, and



Barker Bench Type Mill



**ONE
Tool
ONE
Set Up**

...for boring,
facing, turn-
ing, recessing,
undercutting.

Another NEW "MASTER TOOL" THE UNIVERSAL

"MASTERHEAD"

Featuring: automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; seven models for work up to 24" diameter.

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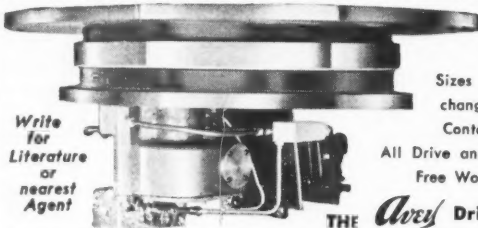
vertical head travel by hand lever operation on the production model or by accurately calibrated micrometer feed screws on the toolroom model.

Designed for safe, efficient operation by inexperienced operators, the machine is powered by a $\frac{1}{4}$ h.p. 1,750 r.p.m. heavy duty ball bearing motor and is provided with spindle speeds of 875, 1,750, and 3,500 r.p.m. The total weight of the unit is 152 pounds.

Conveyor Designed Especially for Handling Cylindrical Objects

A concave roller conveyor designed especially for handling all types of cylindrical objects such as shells has been announced by The Alvey-Ferguson Co., 75

Alvey AUTOMATIC INDEX TABLE Meets Demand for DRILLING and TAPPING EQUIPMENT



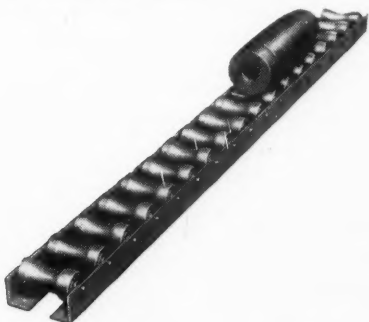
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Sizes 16", 20", 24", 30", 36" Tables Interchangeable. 4 to 18 Indexes. Entire Unit Self-Contained. Built on Unit Construction Principle. All Drive and Control Mechanisms underneath Table for Free Work Surface • Easy Accessibility!

THE Alvey Drilling Machine Co., Cincinnati 1, Ohio

Disney St., Cincinnati 9, Ohio. The conveyor is said to keep the cylindrical objects in the center of the conveyor line and prevent them from slipping to either side or sliding off.

The A-F Concave Roller Conveyor is



A-F Concave Roller Conveyor

made of No. 10 gauge steel tubing and is available with a $\frac{1}{8}$ -inch shaft for ordinary work or a $\frac{11}{16}$ -inch shaft for heavy duty work. Either size shaft can be furnished with plain, dust-tight, or grease-seal ball bearings, and the concave rollers can be furnished with rubber coverings, if desired, to prevent scratching and for complete protection of the objects moving along the line. Both straight and curved sections of A-F Concave Roller Conveyors are available.

Boring Chuck Offers Fast Setup

The Samson Offset Boring Chuck shown herewith is now being manufactured by Last Word Sales Co., 18500 Mt. Elliott, Detroit 34, Mich. The block operates in dovetail ways and the block, cover, and body, all of which are machined from the solid and ground, are also lapped on contact areas for rigid fit of the block and

precision setting. Fast and accurate setting of the tool hole at dead center is said to be accomplished through provision of a positive stop against which the tool block is retracted.

The micrometer offset screw affords adjustment to 0.001 inch and is also hardened, ground, and lapped. The tool hole in the block (standard sizes, $\frac{1}{8}$ to $\frac{1}{4}$ inches) is ground and is provided with two set screws for holding the tool with maximum rigidity. The chuck is available with either a threaded body or integral taper shank. When installed in a milling or boring machine, the chuck

Lassy WORK HOLDER



Quick, accurate setups on lathes, jig borers, milling machines, grinders & drill presses. Guaranteed accuracy .0002 in three inches. Made of finest cast iron, normalized for accuracy. Round steel insert hardened and

ground. Recess in V to hold objects with heads. Holes for work stops. Case hardened clamps with slots for quick reversing without removing screws. Eccentric counterbalance weights for quick, easy balancing. Capacity $\frac{1}{8}$ " to 2".



Model R (illustrated) \$49.50

Model P with quick acting swing clamps F.O.B. Plainville, Conn. \$67.00

SETUP FOR TURNING OR GRINDING. Two bolts thru base fasten work holder firmly to face plate.

LASSY TOOL CO., Plainville, Conn.
MAKERS OF LASSY TAPPERS

Avey AUTOMATIC UNITS for DRILLING • TAPPING

REAMING • HOLLOW MILLING and DEEP HOLE DRILLING

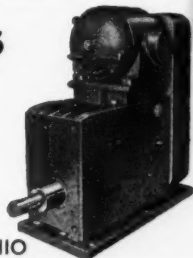
Vertical, Horizontal or Angular Mounting.

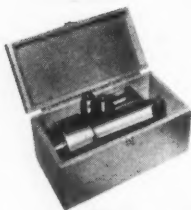
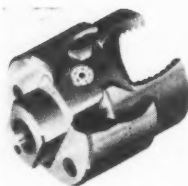
Made in two sizes . . . No. 1 & No. 2 Morse Taper.

Here's a packaged unit . . . that will simplify your

HIGH PRODUCTION PROBLEMS. Write for details.

THE Avey DRILLING MACHINE CO., CINCINNATI 1, OHIO





(Left) Cutaway view of Samson Offset Boring Chuck. (Right) Samson Offset Boring Chuck Set

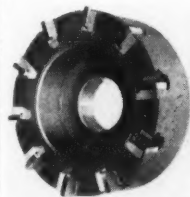
provides a tool-holding device for cutting tools, set-up bars, and other items.

A complete line of interchangeable accessories is available for use with the chuck. All accessories are made of alloy steel which is hardened, drawn, and ground to provide a 0.0005-inch slip fit in the tool blocks.

Cutter Mills Cast Armor Plate

A solid carbide indexable blade face milling cutter designed for milling cast armor plate and other difficult steel machining jobs has been added to the line of

Futurmil face milling cutters marketed Detroit Milling Cutter Co., 28625 Grand River Ave., Farmington, Mich. The cutter is said to retain the Futurmil principle of multiple production



Futurmil Solid Carbide Indexable Blade Face Milling Cutter

runs without cutter grinding, the solid carbide blades, when dull, being merely indexed to provide new cutting edge since the clearance angles are taken care of by the position of the blades in the body rather than being ground onto the blades.

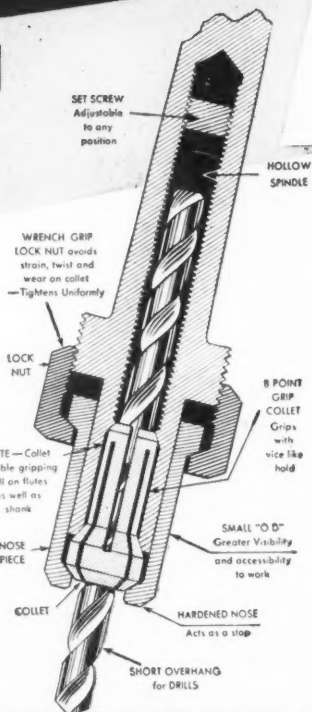
The blades are square and furnished in three optional sizes ranging from 1 to 3/4 inch, depending on the depth of cut desired. The blades can be indexed or sub-

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Only ERICKSON PRECISION COLLETS OFFER...

- 1 Accuracy of .0005" T. I. R. Guaranteed.
- 2 Superior holding power-grips along entire length of collet.
- 3 Grips on flutes—permits stubbing of drills.
- 4 7 "single purpose" collets replaced by only 1 Erickson Collet.

There is an Erickson Collet, mandrel, air chuck, or indexer to answer each of your holding problems. WRITE for Catalog "A"



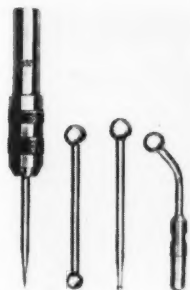
ERICKSON TOOLS DIVISION

2303J Hamilton Ave. • Cleveland 14, Ohio

stituted without removing the cutter from the milling machine spindle. According to the manufacturer, each blade can be indexed eight times before regrinding is required.

Attachments Increase Usefulness of Center Finder

The L. S. Starrett Co., Athol, Mass., is now offering a "wiggler" or center finder, designated as the No. 832, with additional points and attachments which make it widely adaptable to precision work. The attachments are clamped in a



Starrett "Wiggler" with additional points and attachments

shank by a ball swivel joint which is said to permit adjustment to true concentricity or to any desired angular position.

With the sharp point working centers for jig and tool work or for vertical or milling machines can be quickly and accurately located. The ball contact is said to be useful in locating work by first bringing the contact (ball diameter, 0.250 inch) against the work, slot, hole, shoulder,

or end and then indexing the work to the desired position relative to the spindle. Another contact has a small disc at the end 0.100 inch in diameter which permits use in confined areas such as slots, shallow holes, and so on. Using the offset indicator holder in conjunction with Starrett Last Word Test Indicators, the mechanic can sweep holes or outside diameters for checking runout for concentricity; establish center distances; check straightness or alignment of flat surfaces; and perform other jobs in machining, layout, checking, or inspection.

**THE COMPLETE LINE FOR
EVERY INDUSTRIAL PURPOSE
over 5000 shapes, sizes and cuts**

1/8" SHANKS

1/4" SHANKS

1/2" SHANKS

FULL SIZE

**GROBET
Hand Cut, and
Ground from Solid
ROTARY FILES**

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LEADING
SUPPLY HOUSES**

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**GROBET INSIDE
TUBE-DEBURRING
FILES**

**HAND CUT
DISC FILES
(1/4 Size)**

**KEY CUTTING
FILES**

**GROBET
TUNGSTEN BURS
Inexpensive,
but finest
at any price.**

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**GROBET
High Speed Rasps**

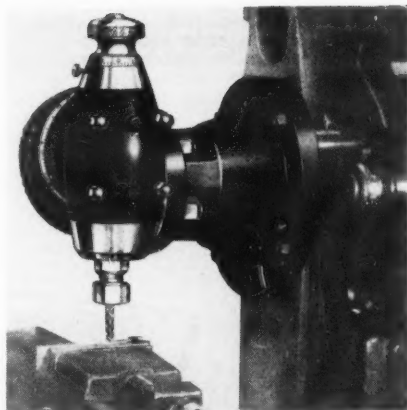
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FIN FILES**

GROBET FILE COMPANY of AMERICA, INC.
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NEW YORK • CHICAGO • MONTREAL

Head Bores and Mills at Angles on Horizontal Millers

Brown Mill Tool Co., 5443 San Fernando Rd., W., Los Angeles 39, Calif., has announced a micrometer precision vertical milling head for angle boring and milling on horizontal milling machines. The head has a micrometer, vertical quill spindle feed calibrated in 0.001-inch increments. The travel of the vertical spindle ranges from 1½ to 3 inches.

The ground thread micrometer lead screw of the head has a navy bronze stud for spindle end thrust support with set



Brown Vertical Milling Head

screw take-up adjustment. Adjustments can be easily made with an ordinary Allen wrench. The gear housing is of semi-steel with precision preloaded ball bearings throughout and hardened and ground spiral and helical gears. The gear rating is 1½ to 15 h.p. Spindles are hardened and ground and provided with a two-piece collet tightening nut.

The head is available in 25 models for every make and size of horizontal milling machine. Any model can be supplied with or without the micrometer feature.

.....CARROLL..... DIVIDING HEADS



Catalog
on
Request

3 SIZES — 4 MODELS — 6" to 12"

CARROLL DIVIDING HEAD CO.

3525 Cardiff Ave., Cincinnati 9, Ohio



GRAY TURRET HEAD METAL CUTTER OR NIBBLER

N.A.M. Pioneer Award
Given to Gray

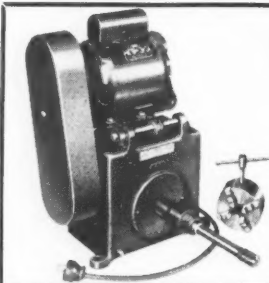
Most modern Nibbler for
Template Cutting, Tool
Rooms, Shipbuilding, Air-
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ing, Sheet & Plate Shops.

GRAY MACHINE CO.

Box 596, Philadelphia, Pa.

Pneumatic Grinder Ideal for Grind- ing Small Dies and Castings

A pneumatic die grinder which is designed to solve many precision grinding problems on small dies, castings, and hard-to-get-at areas has been developed by Mall Tool Co., 7814C S. Chicago Ave., Chicago 19, Ill. The entire tool is 4½ in-



NEW! SAVE TIME AND MONEY POWER REAMING MACHINE

3 speeds—has many uses, reaming, chamfering, horizontal tapping, lapping and honing unit compact and priced to spot at convenient locations.

MANUFACTURERS OF CATSKILL ABRASIVE CUT-OFF MACHINES

JOSEPH E. MURPHY CO.
24 ELLSWORTH ST. WORCESTER 3, MASS.

Write for complete data and specifications



Mall Pneumatic Die Grinder

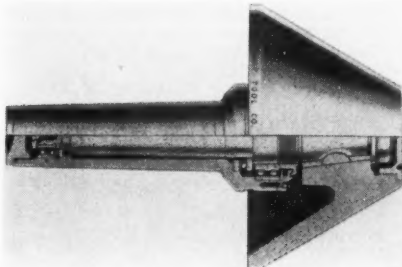
ches long x $1\frac{1}{4}$ inches wide and weighs 12 oz. A choice of lever or button-type throttle with special collet guard allows the operator to hold the tool close to the work, permitting finger-tip operation with easy balance in close-working areas. An arbor runout within 0.0015 inch allows for extremely accurate work where pinpoint grinding is required.

Eight sizes of Erickson precision collets for accommodating shanks from $\frac{1}{8}$ to $\frac{1}{4}$ inch are available for the grinder, which includes a rotary vane type air motor that is said to be cool running and to develop a maximum speed of 26,000 r.p.m. Speeds can be stabilized by a built-in speed regulator within a limited range to suit each application. Air exhaust is directed away from the operator where it cleans and cools the work. The motor is equipped with a noise silencer which is claimed to eliminate annoying high pitch tones. The housing is made of polished aluminum alloy.

Multi-Purpose Center Has Replaceable Point

The Red-E-Superaccurate Multi-Purpose Center announced by Ready Tool Co., 540 Iranistan Ave., Bridgeport 8, Conn., is described as a bull nose, replaceable point center so designed that the bull point can be removed quickly and

Red-E-Superaccurate Multi-Purpose Center



ENAMEL FILL

WITH COLOR, or
PRINT STAMPED,
DIE-CAST, EMBOSSED
AND MOLDED METAL AND
PLASTIC PARTS WITH —



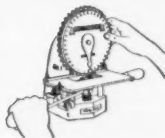
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METAL INKS,
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AND ALL KINDS
OF STANDARD OR
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ING EQUIPMENT
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Company

9 MORRELL ST., ELIZABETH 4, N. J.
"THE ORIGINAL MARKING SPECIALISTS"



UNIVERSAL DRILL BUSHINGS establish new standards of high quality

Universal Drill Bushings, produced at the big, modern plant of the Universal Engineering Company, have been first in industry for more than 25 years. They are accurately machined with superhoned bores from the finest quality steel. They are carefully inspected to insure maximum efficiency and extremely long life. Write today for complete information.



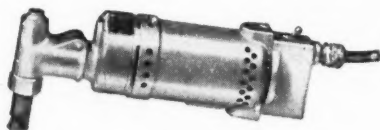
The modern home of finer production tools

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 9, MICHIGAN 156-B

another bull point inserted to accommodate the work without having to remove the center from the machine. Particularly suited for heavier type of work on tubing or pieces with large center holes, the center is available in any required shank, taper, or head size for use on engine lathes, turret lathes, or grinding machines.

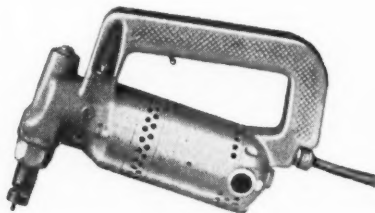
Electric Nibblers for 14 and 18 Gauge Hot Rolled Sheet Steel

Designated as the Jemco Models 50 and 75, two electrical nibblers for cutting 18



Jemco Model 50 Electric Nibbler

gauge (0.0478-inch) and 14 gauge (0.0747-inch) hot rolled sheet steel respectively (other materials in proportion) are now being manufactured by Jefferson Engineering & Mfg. Co., 269 Walker St., De-



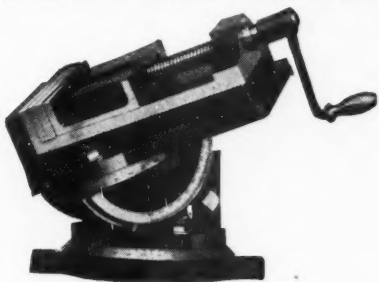
Jemco Model 75 Electric Nibbler

troit 7, Mich. Each tool is designed to cut corrugated sheets or uneven surfaces and nibble out corners. The cutting operation may be started in the middle of a sheet if an access hole for the anvil is produced.

The Jemco Models 50 and 75 Electric Nibblers are each equipped with a universal motor designed for operation on either d.c. or a.c., 110 or 220 volts. Each tool has a feed rate of 3 feet per minute and is supplied complete with a cable and plug. The Model 50 weighs 5 pounds and the Model 75 weighs 10 pounds.

Multi-Swivel Vise Applicable to Production of Angular Pieces

Designed to meet the requirements of toolmakers and machine shops where a



Master Multi-Swivel Vise

wide variety of work is encountered, such as producing angular pieces and forms, dies for sheet metal stamping, and other irregularly shaped pieces, the Master Multi-Swivel Vise illustrated herewith, product of Donovan Mfg. Co., 80 Battery-march St., Boston, Mass., can also be

used in determining and forming the edges for model parts of machines and work of a similar class. The vise can be set at any angle and work placed in position and removed without disturbing the setting. Moreover, the vise can be easily moved from one machine to another and several operations performed without removing the piece.

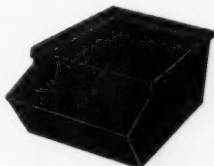
All parts of the unit are readily interchangeable, thus enabling it to be used as a plain flanged vise, plain swivel vise, or multi-swivel vise. As a multi-swivel unit, angles and the compounds of angles can be quickly and accurately set and complete rigidity assured due to the construction of the unit. The vise itself is fastened to a 360-degree swivel on the cradle which can be set to any angle to 90 degrees in a vertical plane, and the vise and cradle together can be turned a full 360 degrees on the base. The vise is offered in 2, 4, and 6-inch sizes.

Reel Dollie Available in 2 and 4-Ton Capacities

Metzgar Co., 466 Douglas St., N. W., Grand Rapids, Mich., has introduced an all-steel reel dollie featuring two ball-



"Stack Up"



Sterling Bin Front "Top Rim" Steel Stacking Box.
Size: 18" x 12" x 6".

THESE BOXES AGAINST ANY!

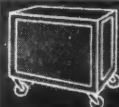
Once you use and compare Sterling stacking boxes, you'll know why we invite comparison in design, construction, and price. Our "Top Rim" construction provides stronger support all around the box . . . no corner inserts to become loose and fall out. Efficiency in designing and manufacturing allows us to quote favorably on any type or size stacking box.

Write for literature and prices.

Sterling Factory Equipment Co., 183 Charles St., Providence, R. I.



Sterling "Top Rim" Steel Stacking Box with drop handles.
Size: 18" x 12" x 6".

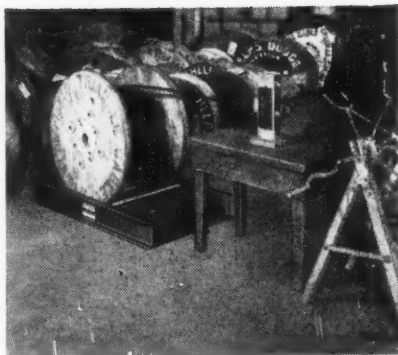


Sterling
Quality Handling & Storage Equipment



bearing mounted 5-inch steel rollers supported in a heavy welded steel frame with built-in steel ramp for "roll on" loading. Reels require no spool-axle support but spin easily on the free-running rollers to pay out such material as wire, cable, rope, belting, and fence. The dolly can be used with metering and rewind equipment, as shown in the accompanying illustration. The front roll has a locking pin and the rear roll is adjustable to accommodate reels from 16 inches to 8 feet in diameter.

The dolly is available in two models, designated as the 1-S and 2-S. The Model 1-S has a 2-ton capacity and over-



Metzgar All-Steel Reel Dolly in use

all frame width of 30 1/4 inches; includes 25-inch long rollers on a 1-inch steel shaft; and weighs 208 lb. The Model 2-S has a 4-ton capacity and overall frame width of 46 1/4 inches; includes 41 1/4-inch long rollers on a 1 1/4-inch steel shaft; and weighs 307 pounds.



CLEAN, DRY AIR
WITH
MURPHY SEPARATORS
AND AFTERCOOLERS

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Jas. A. Murphy & Co., Inc.
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**SOMETHING NEW
UNDER
THE SUN**



Finished holes 1 1/2" to 1 3/4" diameter to a depth of 8" in one rapid operation on your present equipment with

THE BOREMASTER

Not just another Trepanning Cutter but a real heavy duty tool. Stock removed in one piece eliminating waste.

**TIME SAVINGS + MATERIAL SAVINGS
= COST SAVINGS**

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381 - 4th Ave., Dept. MMS, New York 16, N. Y.

Deep Hole Drilling Oil

A deep hole drilling oil formulated exclusively for deep hole drilling and boring in metals, including the extremely high alloy steels, has been introduced by Conner Tool & Cutter Co., 1000 E. McNichols Rd., Detroit 3, Mich. Widely tested in the company's own contract drilling and boring shop, the oil, when used with a high pressure pump, is claimed to provide an ideal chip-flushing action; constantly uniform chip formation; effective cooling of tool and work; excellent lubrication; increased production through fast metal removal and minimum shutdown time; unusually long tool life; and maximum economy.

**READING BENCH
KEYSEATER**

Portable — move directly to job; a time saver for both small and large shops.

3 1/4" stroke; adaptable for other work.

Low first cost — prompt delivery.

Good dealers wanted.

READING MACHINE CO.
CINCINNATI 37, OHIO

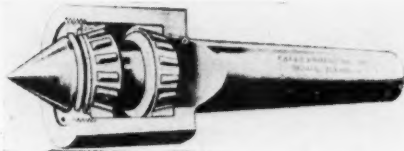


Improved Center Incorporates Matched Tapered Roller Bearings

The accompanying illustration shows the Falls Improved Roto Center for lathe and grinder tailstocks announced by Falls Products, Inc., 124 Genoa St., Genoa, Ill. The center incorporates two identical precision quality Timken bearings, accurately matched and with eccentricity points lined up for anti-friction rotation and high load-carrying capacity.

Additional features of the center include a threaded retainer ring to preload

bearings for absolute rigidity and to provide adjustment in compensating for any bearing wear; hardened alloy steel spindle with point ground in its own bearings after assembly to assure maximum runout of 0.0002 inch total indicator reading; heavy duty grease seal in the retainer, with a rotating neoprene ring forming a highly efficient labyrinth seal against the entrance of foreign matter; tapered rollers which provide a large contact surface with bearing races to ensure against bearing damage from shock loads and abuse; high quality steel shank, induction hardened for maximum strength and wear resistance and precision ground for accurate fit; and grease port with 1/8-inch pipe thread at the rear of the shank to accommodate a standard hydraulic grease fitting. The grease port also allows for the insertion of a threaded rod rotating the spindle when redress-



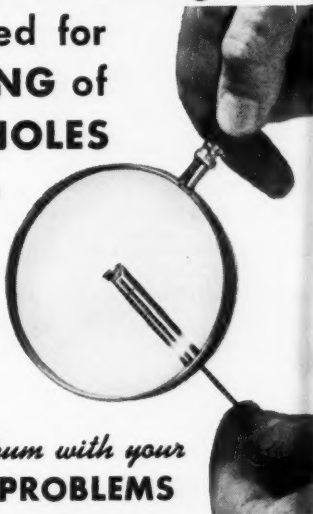
Falls Improved Roto Center

ing the point is required.

The improved center is available with four different types of interchangeable spindles.

THIS Solid Carbide Boring Tool is what you need for precision BORING of DEEP, SMALL HOLES

This Bokum tool provides a practical way to bore to greater depths in ratio to diameter. Finish bore often in one pass. More rigidity permits higher speeds without chatter. Send for Catalog 948.



Come to Bokum with your BORING PROBLEMS

Bokum high-speed steel tools for general boring and threading are distinguished by their helical backed off form, which produces a smooth, clean, precision bore. Ask for Cat. 1139-6.

Carbide-tipped boring and internal threading tools. Cat. 398. All Bokum tools available in sets in assortments of your own choice. Cat. Supl. No. 1139-6.

Tool Holders for holding Bokum Boring Tools in lathes and turret lathes. Cat. 483.

Resharpener fixtures to prolong the long life of Bokum Boring Tools. For small tools Nos. 00000 to 3. Cat. AB-1. For large tools Nos. 4 to 12. Cat. AB-4-12.



BOKUM TOOL CO.

SINGLE POINT BORING TOOLS—INTERNAL THREADING, BOTTOMING AND FACING TOOLS—CARBIDE TIPPED TOOLS

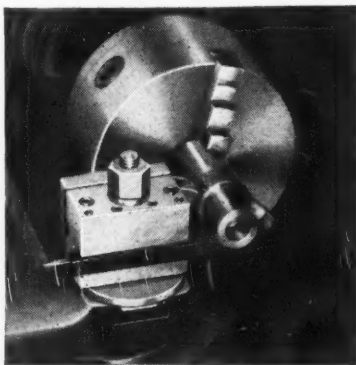
DEPT. B • 14775 WILDEMERE AVE. • DETROIT 21, MICH.

"10-in-1" Toolholder Simplifies Toolholding Problems

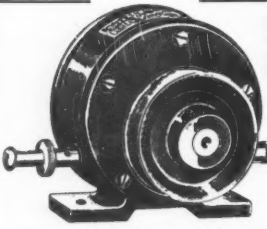
South Bend Lathe Works, South Bend 22, Ind., has introduced a "10-in-1" toolholder of the universal type which is available in five sizes for South Bend lathes and can be easily adapted for use on some other makes of lathes. Constructed of heat-treated steel, the holder features screw adjustment for tool height. Once adjusted, tools of the same type can be changed without disturbing the height adjustment.

The 10-in-1 toolholder is furnished com-

plete with a center-aligning knurling head and a pair of medium diamond knurls. Coarse and fine diamond knurls



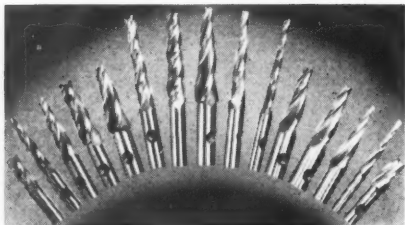
South Bend "10-in-1" Toolholder set up for knurling operation



ROTARY BLOWERS
for
BLOW TORCHES
Send for Circular

BUFFALO DENTAL MFG. COMPANY
Buffalo 3, N. Y.

and coarse, medium, and fine straight pattern knurls are available, as well as boring tools, cutting-off blades, and a set of four ground cutter bits for boring, cutting-off, turning, facing, and threading operations.



CONICAL TAPERED END MILLS

For Faster, Smoother Cutting—Less Breakage.
Reduced Spindle Vibration.
Long, Durable Performance.

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CONICAL TOOL CO.
3802 Buchanan S.W., Grand Rapids 8, Mich.

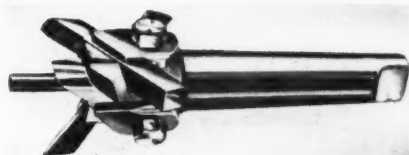
Cutter Is Said to Produce Finished Holes in Various Materials

The cutting of accurate, finished holes in a single operation is said to be possible with a 3-blade adjustable hole cutter announced by Robert H. Clark Co., Dept. MM, 9330 Santa Monica Blvd., Beverly Hills, Calif. Claimed to cut equally well on steel pipe, stainless steel, boiler plate, hard fiber, Transite, and other problem materials, the tool includes replaceable

CONSERVE CUTTING TOOLS
buy the **RIGHT CUTTING FLUID**



D.A. Stuart Oil CO.
2741-47 S. Troy Street, Chicago 23, Illinois



Clark 3-Blade Adjustable Cutter

cutter blades that are easy to sharpen and set. The body of the tool is made of specially selected heat-treated steel with three high speed steel blades set 120 degrees apart. The pilot is removable to permit the use of lead drills.

The adjustable hole cutter is available in models for cutting holes from $\frac{3}{8}$ to 5 inches in diameter in materials ranging from thin sheets to 1-inch thick materials.

Mechanically-Held Carbide Tools Redesigned to Eliminate Chip Erosion of Tool Shanks

To eliminate chip erosion of the tool shanks, Firth Sterling Steel & Carbide Co., McKeesport, Pa., has designed its complete line of mechanically-held (Mechanigript) carbide tools. Each tool now features open facing of the carbide insert so that the chips curl against the carbide. In the former design, the steel shank merely surrounded the carbide and, even though hardened alloy tool steel was used, considerable chip erosion was experienced.

Additional features of the Firthite Redesigned Mechanigript Tools include top or bottom screw adjustment of the carbide inserts, thus making it practical to use conventional or inverted mounting

Firthite Redesigned Mechanigript Tool



ROGERS Adjustable Hollow Mills

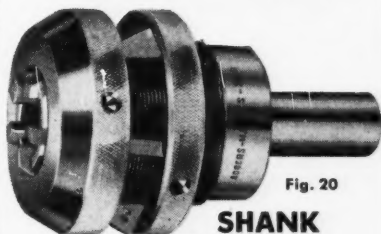


Fig. 20

**SHANK
INTEGRAL**

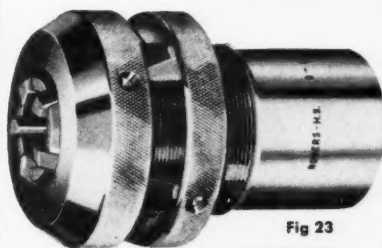


Fig. 23

**ARBOR
SEPARATE**

(Both figures available in sizes from $\frac{1}{16}$ " to $2\frac{1}{2}$ " — Special Sizes to order)

Either Straight Shank or Morse Taper Shank available with each tool

**Adjustable Blade Reamers,
Align Reamers and End
Mills to specifications**

**THE JOHN M. ROGERS
TOOL CO.**

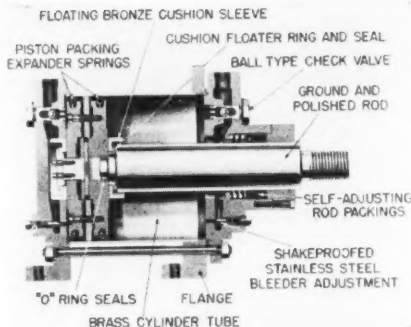
GLOUCESTER CITY, N.J.

of the tools and still have easy access for adjusting the carbide inserts as required. The tools are made in 10 styles with seven sizes of each style for round, triangular, square, or rectangular carbide inserts made to the shape and size standards established by the Carbide Industry Standardization Committee.

Low-Pressure Cylinders Operate by Air, Oil, or Water

A complete line of low-pressure cylinders which can be operated by air, oil, or water is now being manufactured by Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill. Outstanding feature of these cylinders include a cork float ring which is said to facilitate cushion alignment with the head and ensure a seal during cushioning; spring-backed chevron rod packings which are self-adjusting for consistently correct compression; and a flange design which permits removal of the front head without disturbing the mounting.

Hanna LP Cylinders are designed for



Cross-sectional view of Hanna LP Cylinder showing design and construction features

operation at pressures up to 110 p.s.i. and, with minor modifications, for higher pressures depending upon the cylinder diameter and operating medium (air, oil, or water). Standard models permit the selection of a cylinder to meet practically any mounting requirement.

Announcing

the sensational new!

DEFIANCE

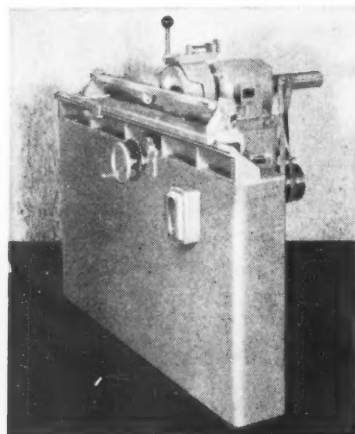
Automatic Knife Grinder

LOW IN PRICE — HIGH IN QUALITY

- With Full 38" Capacity
- 100% Ball Bearing Construction Throughout
- And Many Other Features For Top Speed, Accuracy and Efficiency.

Write Today for Literature and Complete Details—Dept. MDC-111

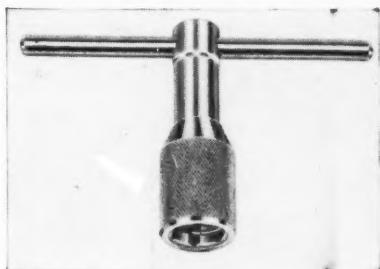
Dealer Inquiries Invited.



MICHIGAN DEFIANCE CO. BIG RAPIDS, MICHIGAN, U.S.A.

Wrench Accommodates Taps from 8-32 to 3/4 Inch

Intended for supplementary use in the machine shop, a tap wrench which is said to readily fit into mechanics' tool

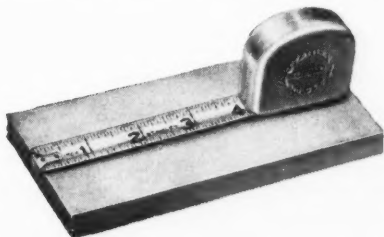


Dahlstrom Tap Wrench

kits has been announced by Dahlstrom Mfg. Co., 2522 W. Larpenteur Ave., St. Paul 8, Minn. Designed for the quick changing of taps by using Dahlstrom tap adapters, the wrench is constructed to accommodate taps in sizes from 8-32 to 3/4 inch. Made of polished steel, the wrench weighs 6 1/2 oz. and can be supplied with or without a set of adapters.

Pull-Push Rule Features Wide Blade for Maximum Rigidity

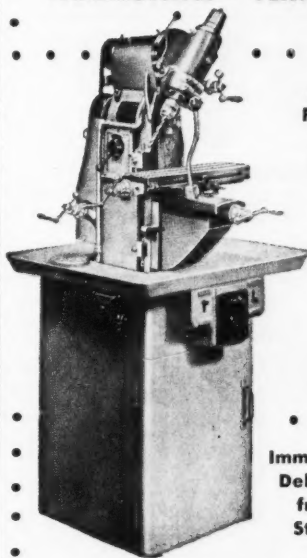
Available in 6 and 8-foot lengths designated as the Nos. 556 and 558 respectively, the Stanley "Pull-Push" Rule an-



Stanley "Pull-Push" Rule

nounced by Stanley Tools, New Britain, Conn., features a sturdy 5/8-inch wide nickel-plated blade having a special rust-resistant finish built up around graduations and numerals for maximum wear.

COMPARE THE NEW CENTEC 2 A PRECISION UNIVERSAL MILLING MACHINES MADE IN ENGLAND BENCH AND PEDESTAL TYPE HORIZONTAL - VERTICAL



6 SPEEDS
FORWARD
AND
REVERSE

FULLY
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Delivery
from
Stock

Made in England, these precision built machines are specially designed for short runs of small and intricate parts to close tolerances, which can be machined by horizontal and vertical milling, drilling and boring.

The CENTEC millers are equipped with a 1" arbor, No. 2 M.T., and 3/4 H.P. motor. Available with swivelling table, and swivelling head with sliding spindle for milling at all angles.

Write for full details and specifications . . . and surprisingly low prices!

DE WITT EQUIPMENT CO.

136-B Lafayette St., New York 13, N. Y.

Telephone: Walker 5-4048

Flexible for measuring circular and angular surfaces, the blade, it is claimed, may be safely and positively replaced in a few seconds outside the D-shaped satin finish case which has a brushed nickel-plated case which has a brushed satin finish and is said to be handy for inside measurement by reading measurement at case opening and adding 2 inches (width of case) for exact inside dimensions. The large black numerals and graduations on the blade are easy to read.

A similarly styled No. 566E engineer's rule is graduated in 10ths and 100ths of feet on the lower edge only.



DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

WATTS BROS. TOOL WORKS
Wilmerding, Pa.

A BLANKING DEPARTMENT

FOR
\$120.00?

Tool your jobs at low cost from our wide variety of standard punches & dies.



Leslie
Model A
Hand
Punch
Press

Sounds Far Fetched? Well, consider these points:

- Capacity Up to 15 Tons
- Patented Leaf Provides Positive Punch and Die Alignment
- 6" Throat Depth
- Large Punch Plate and Bed Facilitate Blanking Over Big Areas.

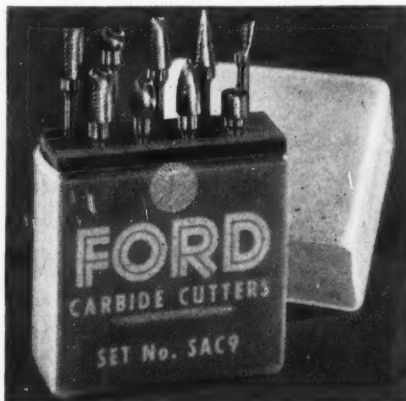
The Leslie Model A Press is the solution to your short run blanking problems. Write now for illustrated catalog and circular showing punches and dies. Diagram above illustrates versatility of this Press — each blanking done with one stroke.



LESLIE WELDING CO., 29 Carroll Ave., Chicago 12

All-Purpose Carbide Cutter Sets

Designed to meet practically every rotary carbide cutter requirement, four all-purpose carbide cutter sets offering pack-



Ford Rotary Carbide Cutter Set

aged convenience and protection have been announced by M. A. Ford Mfg. Co., Inc., Dept. V-7, 732 W. River, Davenport, Iowa. Each set includes from 5 to 12 shapes of cutters suitable for various type of burring, light milling, blending, and finishing. The tools are packaged in a plastic container to keep them clean, reduce loss, and for convenience of storage on shelves or in a tool chest. A wood insert holds the tools firmly in place, reducing the possibility of damage, and each tool is identified on the package to aid in the replacement of individual tools. Tool sizes in the various sets include 1/4-inch bodies on 1/4-inch shanks, 1/2-inch bodies on 1/4-inch shanks, and 1/4-inch bodies on 1/8-inch shanks.

ATLANTIC GEARS

**SPUR
SPIRAL
WORM
BEVEL
GEARS**
GENERATED WITH
PRECISION ON
MODERN EQUIPMENT

SEND
SAMPLES OR
BLUEPRINTS
FOR
QUOTATION

ATLANTIC

GEAR WORKS, INC.

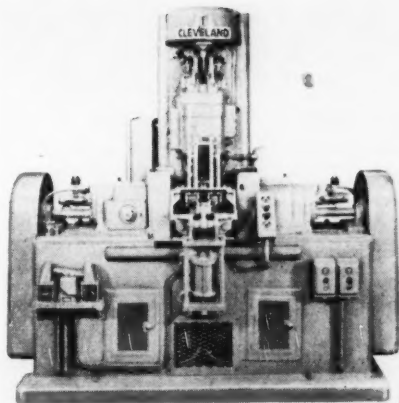
198-ALAFAYETTE ST. • N.Y. 12, N.Y. CA 6-1440

Machine Automatically Taps and Chamfers Fittings

Identified as the Series F, a machine for the pipe and conduit fittings industries has been developed by The Cleveland Tapping Machine Co., Subsidiary of Automatic Steel Products, Inc., Canton 6, Ohio. The machine is available in three models designated as the F-1, the F-2, and FT-1.

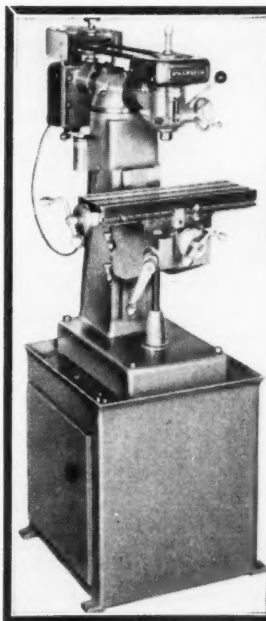
The Models F-1 and F-2 are fully automatic in operation and are fed from magazine-type hoppers. Each of these models is designed to machine two 90-degree ells, street ells, or reducer ells at each stroke of the machine, threading and chamfering simultaneously from the cored hole. The Model FT-1 is said to completely tap and chamfer two tees at each stroke. A production of 1,500 half-inch ells may be attained on the Model F-1 in malleable iron, it is claimed. Accuracy of angular alignment is said to be maintained within $\frac{1}{16}$ inch using 18-inch extensions in the tapped holes. Hardened and precision ground lead screws are attached to each spindle, and circuit breakers or shear pins are provided for protection against hard castings.

The motors on the Model F-1 consist of two 5 h.p. motors one to each of the horizontal spindles, and one $7\frac{1}{2}$ h.p. mo-



Cleveland Series F Lead Screw Fittings Machine

tor for the two vertical spindles. The Model F-2 has four 5 h.p. motors, one to each spindle. The air-operated automatic work-holding fixture is self-compensating and slides on hardened and ground round ways. The jaws are fully adjustable and quickly interchangeable.



Every Machine Shop Needs a JOHANSSON Vertical Mill

For early delivery, order your machine today.

The JOHANSSON Vertical Milling Machine is a precision tool having *rigidity, flexibility and range*. Feed screws are precision ground, mounted in pre-loaded bearings with $3\frac{3}{16}$ " diameter dials graduated into 100 increments. Speed range, 180 to 3250 r.p.m. $\frac{1}{2}$ h.p. motor. Quill travel, $2\frac{1}{16}$ ". No. 7 B. & S. or No. 2 Morse taper in spindle optional. Table, 6" x 18", longitudinal feed, 12", cross feed, $4\frac{1}{4}$ ". Vertical feed of knee, 12". Maximum distance spindle to table, 12".

Write for Literature

Several territories open for representation.

JOHANSSON & WINDLE CO.

6015 DAHLIN DRIVE

SKOKIE, ILLINOIS

Cutting Oil for Aluminum and Aluminum Alloys

Designated as Fiske's C.S.A. No. 2, a cutting oil for machining all types of aluminum and aluminum alloy metals has been developed by Fiske Brothers Refining Co., 129 Lockwood St., Newark 5, N. J. According to the manufacturer, the cutting oil furnishes the proper "bite" for these types of metals and contains a sufficient amount of lubrication to allow for the use of high speeds without "tearing" the work. It is said to produce clean-cut and consistently uniform threads on all threading jobs, and is claimed to be free

from any ingredients which might cause eruption or blemishes of the skin.

Fiske's C. S. A. No. 2 Cutting Oil is described as ideal for boring, counter-boring, reaming, turning, facing, threading, and so on, producing a high finish to the metal without stain.

Gear Pump Recommended for High-Pressure Hydraulic Applications

Recommended for farm tractor hydraulic lifts, lift trucks, power steering, high-pressure fuel transfer, and other high-pressure hydraulic applications, the Barnes Constant-Flo Rotary Gear Pump

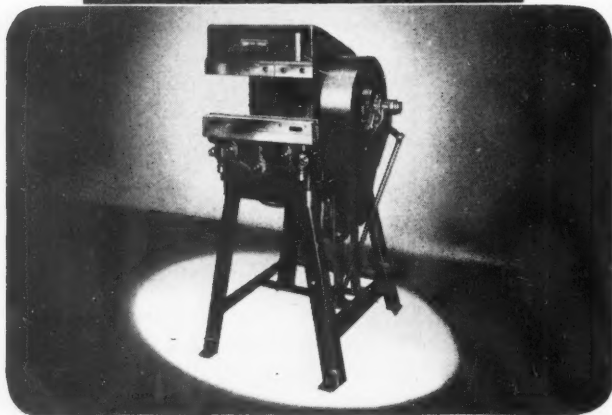


Barnes Constant-Flo Rotary Gear Pump

tary Gear Pump illustrated here-with has been introduced by John S. Barnes Corp., 154 Walnut St., Rockford, Ill. Standard models of the pump are designed to operate at a continuous pressure of up to 1,000 p.s.i. and at intermittent pressures up to 1,500 p.s.i. Special types for higher pressure can also be obtained.

To provide for maximum efficiency, anti-friction bearings are used on both gear shafts of the pump, which is fabricated from a special heat-treated cast iron.

WHITNEY METAL TOOL COMPANY 39 YEARS EXPERIENCE



WHITNEY-JENSEN No. 247 PRESS BRAKE

Production shops turning out quantities of small formings in large presses and job shops requiring a small brake, will find the No. 247 a cost reducing, space-saving piece of equipment. Capacity of the machine is 14 ga. mild steel over $\frac{7}{8}$ " 90° V die or $4\frac{1}{2}$ tons.

Strokes per minute — 47
Throat height — 11-1/2"
Throat depth — 6-1/4"

WHITNEY METAL TOOL COMPANY
110 FORBES STREET, ROCKFORD, ILLINOIS

Universal Depth Gage

Designated as the Model DG-56-R-1, an indicating type universal depth gage announced by Saart, Kraemer, and Hans-



Saart, Kraemer, and Hanscom Model DG-56-R-1
Universal Depth Gage

com, Inc., Harborside Park, 1 Washington Ave., Providence 5, R. I., is said to allow for the measurement of depths, lengths, angles, or steps to tolerances as

fine as 0.00005 inch anywhere in a 3-inch length. The gage includes a $3\frac{3}{4}$ x 4-inch reference plate and weighs approximately 7 pounds.

Designed to utilize any A.G.D. indicator with A.G.D. adjustable bracket back, $2\frac{1}{4}$ -inch diameter dial, the gage comprises a cast Meehanite base which is stress relieved for dimensional stability. The reference platen and edges are finished ground and "Electrolized" for wear and corrosion resistance. Non-working surfaces are crackle finish painted. The gage is furnished with $1\frac{1}{8}$ and $2\frac{1}{4}$ -inch contact points. Adapters for special applications are available on order.

Facing and Boring Head Is Universal

Karl A. Neise, Dept. MMS, 381 4th Ave., New York 16, N. Y., has announced the Wohlhaupter Universal Masterhead, a precision boring and facing head which is suitable for boring mills, jig borers, radial drills, lathes, milling machines, and other machine tools, as well as for production units. A large number of varied operations, including boring, facing, recessing, undercutting, taper and form turning, and threading of stationary

The New and Radically Different BARKER Bench-Type MILLER

With exclusive 3-way hand-lever travel, head, table and saddle.

Cutter end of spindle rotates in a pre-loaded double row ball bearing.

Does the work of heavier, more expensive machines. Low operation cost.

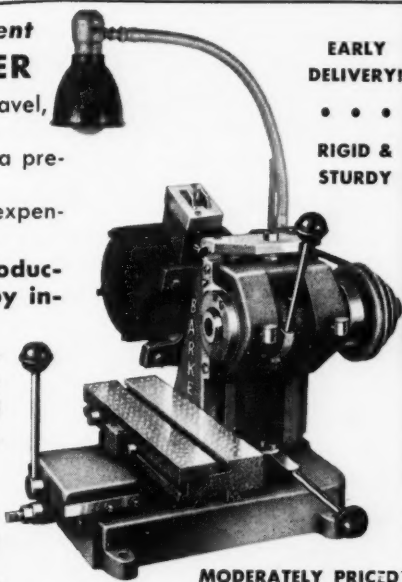
Easily operated for volume production and close tolerance work by inexperienced help.

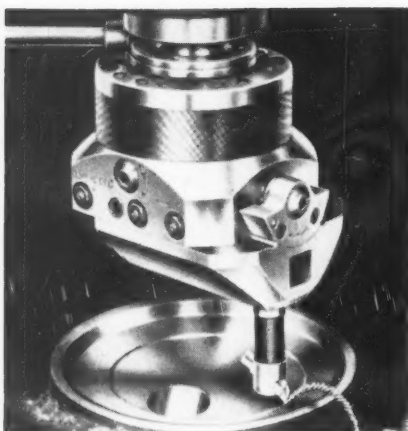
Handles a complete range of conventional milling; profiling, key seating, drilling, end milling, slotting and lathe type operations, such as turning, facing, boring and recessing.

Write for Literature and Information.

THE BARKER ENGINEERING COMPANY

501 Green Rd. • Cleveland 21, Ohio





Wohlhaupter Universal Masterhead

work, can be performed with one hand on one setting.

All parts of the head are hardened and ground, and sliding parts are lapped to ensure high precision and long life. The Masterhead is available in seven different sizes to cover a range of work diameters

up to 24.4 inches, and can be supplied with standard Morse or Brown & Sharpe shanks; also special shanks on order. Models UPA1, UPA2, and UPA3 for work diameters up to 10.2 inches are equipped with one automatic slide feed. Coarse and sensitive settings are made by means of a graduated collar. The automatic cross traverse feed is engaged by means of a retaining ring or stop rod and feed button. The cross feed traverse is set for any desired size by means of an adjustable stop. Upon reaching this stop, a clutch is automatically released, thus disengaging the cross feed traverse. By pushing a button, the quick return movement of the slide is engaged at a feed of 0.020 or 0.040 inch on diameter without stopping the machine spindle. End position of return movement is limited by a second stop.

Models UPA4, UPA4-85, and UPA5-86 designed for larger machines and heavier work up to a diameter of 24.4 inches, are each provided with four automatic slide feeds; namely, 0.00125, 0.00250, 0.00375, and 0.00500 inch. The feeds are engaged by means of a retaining pin and push buttons, the feed collar being kept in place by hand or by means of a stop rod. The return movement of the slide is engaged by reversing the facing traverse or by turning a quick setting screw.

AIR-MITE

(AIR OR SPRING RETURN)

Completely Flexible

AIR-MITE now supplies solid steel upright columns in any lengths required to give you these important flexibility features:

- 1 Normal ram clearance of 0' to 6' may be increased to any clearance required for special application.
- 2 Supplementary or replacement cylinders with any ram stroke required are available for quick, easy mounting on same brackets.
- 3 Rapid socket wrench adjustment cylinder brackets swivels for perfect alignment with work.

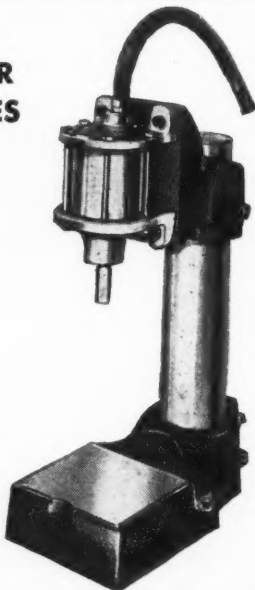
Presses, are available in 1/4, 1/2, 3/4 and 1 ton capacities—for staking, riveting, marking, punching and similar operations.

Write for complete catalog of Air-Arbor Presses and single and double acting Air Cylinders.

AIR-MITE

4417-H West Carroll Ave.
CHICAGO 24, ILLINOIS

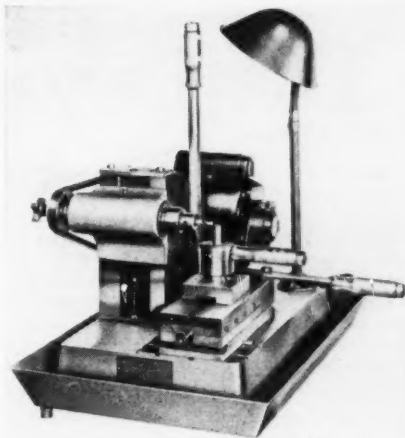
**AIR
ARBOR
PRESSES**



Machine Can Be Set Up for Lathe, Milling, or Grinding Operations

Viking Industries, Dept. B, 220 Montague St., Rockford, Ill., has announced the Viking LMG-3, a combination bench-type production machine which can be set up for turning, milling, or grinding through simple changes in tooling. The machine features a common base, power unit, spindle, and vertical and horizontal slides to which special tooling and fixtures are added for the desired type of lathe, milling, or grinding operation. A complete set of tooling is available for conversion, or the machine may be furnished as a single-purpose unit, where battery production-line operation is required. All attachments are engineered to operate with standard tools. A coolant system is optional.

Spindle speeds with standard pulleys are 825 and 3,450 r.p.m. An additional range of speeds from 100 to 7,000 r.p.m. is optional. The 1-inch spindle with No. 7 B&S taper hole is mounted in heavy ball bearings and has a through hole 13/32 inch in diameter. The spindle is adjustable vertically to a maximum 7-inch distance from center line to work table surface. A standard type 1/3 h.p. 1,725 r.p.m. motor is used to drive the spindle through a conventional V-belt and pulleys.



Viking LMG-3 Production Machine

The Viking LMG-3 requires an overall bench space of 11 x 18 inches and provides a table working surface of 6 x 9½ inches. The net shipping weight of the machine with standard attachments is 145 pounds.

\$270.00
F.O.B. N.Y.
800 LBS. CAP.

\$357.00
F.O.B. N.Y.
2000 LBS. CAP.

Medelton Motor Driven
"Poweroll"

IT'S HERE! A LOW PRICE *Automatic* COIL CRADLE

FEATURES . . .

- Eliminates hazards of lifting heavy rolls.
- Roll on your coil and it's ready to go.
- Slack loop prevents drag on feed or dies.
- 30% to 40% higher daily production on hand or automatic feeds.
- Re-loading time kept to a minimum.
- No pulling of coils, avoids operator's fatigue, and results in faster feeding.

Write for circular.

Dealer inquiries invited.

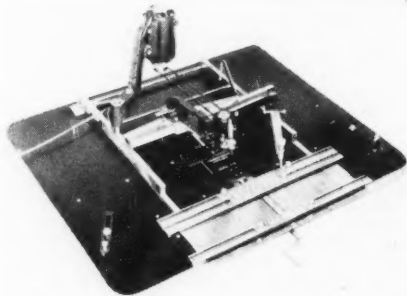
WM. HALPERN & CO., INC.
Machine Tools

51 PARK PLACE 245 CONNECTICUT AVE.
NEW YORK 7, N. Y. BRIDGEPORT, CONN.

Displayed For First

Identified as the Engravograph Model I-S, an enlarged capacity portable engraving machine capable of engraving on units up to 25 inches in width and to any length was displayed by New Hermes, Inc., 13-19 University Pl., New York 3, N. Y. According to the manufacturer, the machine is ideally suited to engraving numbers and instructions on dials, name plates, and panels covering from the smallest area up to extra large dimensions, and is equally efficient for engraving on metal or plastic.

Designed for easy operation by unskilled workers, the Engravograph works on the pantograph principle and is said to be capable of engraving 15 different sizes from one template. It is also claimed to be unique in its ability to perform multi-line engraving in one setup using adjustable copy holding slides.



The Elox M-7 Tapmaster illustrated herewith, N. Rochester Rd., Clawson, Mich., is designed

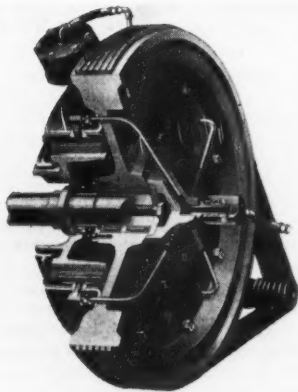
product of Elox Corporation of Michigan, 740 for the removal of broken taps, drills, reamers, and studs at high speeds. Easy to operate the unit employs an "electrode" (a hollow copper alloy tubing available in various diameters) which is chucked into the disintegrating head and held firmly by a collet.



In removing a broken tap or drill, an electrode about half the diameter of the broken tool is used, and the head is lowered so that the electrode is centered approximately $\frac{1}{4}$ inch above the tap. As the head is fed downward, a series of electric arcs is said to cut down between the core and the threads of the tap without damage to the threads. A coolant pumped through the hollow electrode washes away particles of metal. In a through hole, the core can be knocked out as soon as the electrode has cut its way through. In a blind hole, the core is picked out with a magnetized pick or tweezers. Once the core is removed, the remaining threads can be picked out easily. The same method is used on broken drills.

Highly versatile, the Elox M-7 Tapmaster is said to cut and counterbore any type of steel regardless of hardness, thickness, shape, or size. It can be used to cut or enlarge keyway slots in cutters, dies, and so on, and to repair or alter molds and dies.

Time at Metal Show

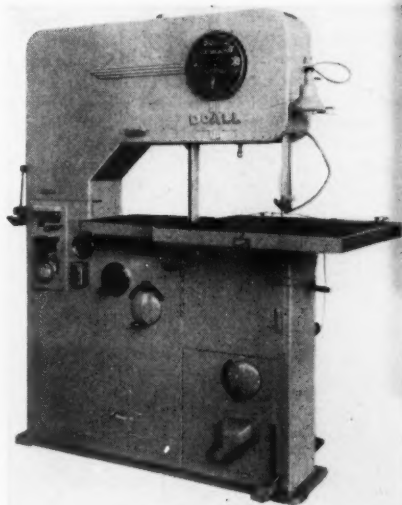


Known as the "Airflex," a new air friction clutch and spring and air-applied brake combination for use with its line of "Press-Rite" power presses was displayed by Sales Service Machine Tool Co., 2355 University Ave., St. Paul 4, Minn. The clutch and brake are both of the constructing drum type and, therefore, utilize centrifugal force to ensure instant engagement of friction surfaces when released. The brake is applied by a constant pressure spring opened and released by air, and its actuation opens a valve to release air from the clutch. Interlocking of clutch and brake action is said to prevent either from being engaged while the other is operating. If air or electric power fails, the clutch disengages and the spring brake stops the press instantly.

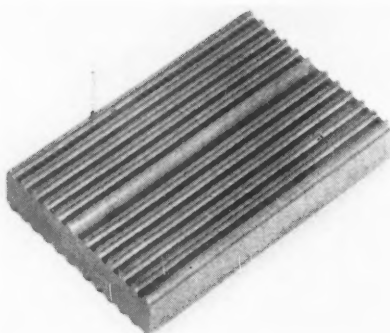
Wear is virtually limited to clutch and brake shoe linings which are self-compensating for wear. Variable clutch gripping pressure permits the operator to set the clutch for every job. According to the manufacturer, the clutch is designed for optimum efficiency at pressures from 40 to 80 lb. and will operate satisfactorily at pressures as low as 25 lb. The clutch-brake arrangement is now available as optional equipment with the No. 30 (30-ton) and No. 85 (85-ton) presses in the Press-Rite line.

Designated as the Model V-36-3, a new general purpose contour sawing machine which is designed to accommodate continuous saw, file or abrasive bands up to 1/2 in. in width was among the band machines displayed by The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. The machine features a three-speed transmission and Speedmaster drive providing variable tool velocity ranging from 25 to 6,000 f.p.m. With this speed range, the machine is said to perform all types of conventional metal sawing or filing, high speed cutting of non-ferrous metal and composition materials, and light gauge alloy friction cutting.

Completely equipped for general purpose contour band machining, the machine includes built-in blade welders with squaring shear; motorized grinder and thickness gauge; assorted band tools and guides; automatic power feed; job selector dials; speed indicator; dust spout; adjustable light; chip blower; and 3 h.p. drive motor and magnetic starter with push-button control. The variable tool speed and feed pressure are controlled by handwheels.



DISPLAYED FOR FIRST TIME AT METAL SHOW



Two high temperature resistant carbide metals — titanium carbide and Series 600 chrome carbide — were displayed for the first time by Carboly Department of General Electric Company, 11143 E. 8 Mile Ave., Detroit 32, Mich. Both products are out of the research laboratory stage. Chrome carbide is at present in the "engineering appraisal" stage. "Pilot-plant" output is being used for application development and appraisal at the present time. The Series 600 chrome carbide is scheduled for quantity production in the near future.

According to the manufacturer, Series 600 in all tests and experimental applications to date has shown unusual resistance to high temperature oxidation. Exposure for 24 hours at 1,850 deg. F. in air is said to leave Series 600

samples still with their metallic luster and virtually no dimensional or weight change. Favorable results also have been obtained in other tests conducted at temperatures over 2,000 deg. F.

The accompanying illustration shows a gage anvil made of Series 600 chrome carbide. In the gage field (gage blocks, ring gages, plug gages, gage anvils), the material is claimed to have demonstrated outstanding ability to resist corrosion and abrasion. Since its coefficient of expansion is about the same as that of steels, readings are said to be unaffected by temperature variations.

Among the various products displayed by Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo, Mich., was a new solid-carbide-insert grinding fixture, designated as the Model VC, which is said to offer an unusually fast and economical method of grinding chip-breaker grooves in round, square, triangular, and rectangular shapes. It can also be used for the rough or finish grinding of dull and damaged inserts.

The fixture can be mounted on most tool and surface grinders. The motor is employed for sharpening all shapes and for grinding chip breakers in round inserts. For grinding chip breakers in square, triangular, and rectangular shapes, the motor is shut off and the spindle is indexed by hand, with a lock pin engaging the index plate on the underside of the handwheel for two, three, or four divisions. The collet spindle can be swiveled on the horizontal axis 90 degrees from vertical to right and 45 degrees to left when looking at the motor end of the fixture, and 360 degrees on the vertical axis. When in the lowest position, the lock pin handle locks the spindle for changing or tightening collets. It is placed in a neutral position for rotating the collet spindle by motor or by hand, and upper position for indexing.

The unit is 7 1/4 inches high x 5 3/4 inches wide and weighs 24 lb. The motor is totally enclosed and fan cooled and is designed for operation on 115-volt single-phase 60 or 50-cycle current.

DUAL CROSS and ROTARY FEED

PALMGREN

Rotary, Index MILLING TABLE

No. 83 Only \$54.50



Has 8" table, 360° movement and 4" cross feed travel. Adjusting wheels and dials graduated in degrees and thousandths. Slotted for bolting to table. No. 82 without rotary feed \$43.75.

Write for Circular No. 354.

CHICAGO TOOL and ENGINEERING CO.
8399 South Chicago Ave. Chicago 17, Ill.

HARDENED and GROUND HSS BLANKS

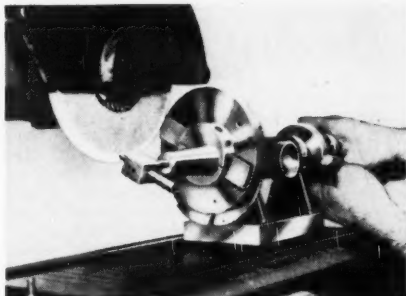
Any decimal diameter to 1/2" — in any length.
Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

Write for price list D-2
WILLIAM T. HUTCHINSON COMPANY
235 Main St. Orange, N. J.

DISPLAYED FOR FIRST TIME AT METAL SHOW

Last Word Sales Co., 18500 Mt. Elliott, Detroit 34, Mich., introduced a new compact precision-built dressing fixture which, when mounted on a magnetic chuck, can be used to accurately dress any radius, concave or convex, with angles tangent to the radius. It can likewise be used for plain radius or angle dressing or any combination.

Setup of the diamond head is described as rapid and simple. Angle stops are incorporated in the fixture for accurate control of relationship of radius and tangent. Two important advantages claimed for the dresser are that it does not require dressing below the wheel to allow for center mounted diamonds and permits use of a guard and dust collector.

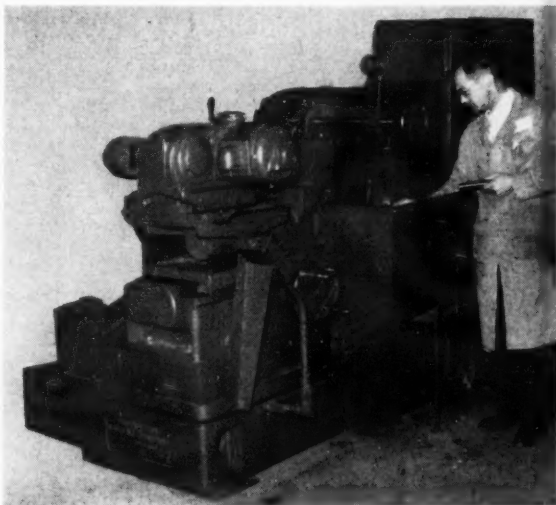


Two new products were introduced by Allied Products Corp., 12625 Burt Rd., Detroit 23, Mich. These included a new die design for inserting clinch nuts in sheet metal. With this design, clinch nuts can be inserted and clinch singly or in groups with each stroke of the press. Conventional die construction is used, with the exception of a hopper and chute which feed nuts into the punch section. The same die can also be used to pierce, blank, or form the part to which the nuts are being fastened.

Also displayed was a new line of extra heavy duty interchangeable punches for extra heavy piercing applications. These new punches and their retainers feature a heavier ball retaining lock than the company's standard line of interchangeable punches and dies.

Among the grinding and finishing machinery displayed by Production Machine Co., Greenfield, Mass., was the Production Type 914, a new heavy duty centerless grinding and finishing machine using abrasive belts and contact wheels. Built to machine tool tolerances and of heavy construction throughout, the machine is designed to grind and finish straight cylindrical work up to 6 inches in diameter. Shoulder work of various diameters can also be handled by the plunge cut method.

The work feeding unit is of similar design to the company's standard belt feed but of heavier construction and mounted on sliding ways for rigid and accurate adjustment for various diameters. The unit is equipped with a micrometer feed screw for size control, assuring steady repeat performance on grinding and finishing operations, it is claimed. A coolant system with gusher pump and tank, spray nozzle, and control permits operation of the machine either wet or dry.



NEW SHOP LITERATURE

Die-Cast Power Transmission Products. Chicago Die Casting Mfg. Co., 2519-21 W. Monroe St., Chicago 12, Ill., has prepared a 20-page catalog (No. 53A) illustrating, listing, and describing a complete line of stock die-cast power transmission products, including single-grooved, V-grooved step, multiple-drive, flanged, crown face, and variable speed pulleys; miter gears; variable speed transmissions; flexible and sleeve couplings; universal joints; pillow blocks; journal bearings; shaft supports; flange bearings; shaft collars; handwheels; hubs; flanges; dash pots; knobs; mandrels; jackshafts; motor attachments; and other products. A price list of the various products is included with the catalog.

Cutter Grinder. The Ingersoll Milling Machine Co., Rockford, Ill., has prepared a 48-page plastic-bound manual (No. 58) which fully illustrates and describes the Ingersoll Cutter Grinder designed especially for grinding inserted blade milling cutters from 4 to 30 inches in diameter with high speed steel, cast alloy, or carbide-tipped blades.

Machine Shop Specialties. Dahlstrom Mfg. Co., 2522 W. Larpentour Ave., St. Paul 8, Minn., has published a six-page two-color folder containing illustrated, descriptive, and price information on various machine shop specialties, including a tap guide for hand or lathe tapping; tap chuck for lathe and drill press; tap wrench; tap adapters; and a light duty adjustable automatic stock feed stop.

Rotary Tables and Angular Milling Attachments for Portage horizontal boring, drilling and milling machines are illustrated and described in literature now available from The Portage Machine Co., Akron, Ohio.

Threaded Leather Belting. An informative 16-page booklet on belting which includes practical maintenance suggestions and engineering data has been released by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 43, Pa. The well-illustrated booklet contains information on making belts endless on pulleys, types of motor bases, fasteners, lacings, cement, preservatives, and repairing belts. Several helpful belt formulas are included in the engineering data section, along with a table on horsepower rating of shafting of various diameters at various speeds.

Abrasive Belt Grinder. Heston & Anderson, Kirkwood St., Fairfield, Iowa, has published a four-page two-color bulletin (X-2) containing information on the abrasive belt machining method and the "Xpeditor," a portable abrasive belt grinder for high speed deburring and cleaning-up operations on a variety of parts.

Forming Presses. The manner in which airframe manufacturers are using the rubber-pad forming technique to produce short-run wrinkle-free deep and complex stampings in standard hydraulic presses is described in a four-page bulletin (No. 39) published by E. W. Bliss Co., Canton, Ohio. Die diagrams showing the use of a rubber pad in single-action and double-action presses are included, and examples of various Bliss hydraulic presses for both shallow and deep-drawn parts production are described and illustrated.

For Your Convenience...

the "Where to Get It" section of MODERN MACHINE SHOP, originated in February, 1940, provides a quick reference to machinery, tools and supplies advertised in the current issue. Use it consistently. You'll find it's very helpful. (See pages 384, 386, 388 and 390.)

MODERN MACHINE SHOP
431 MAIN STREET • CINCINNATI 2, OHIO

Open End Ratchet Wrenches. Tubing Appliance Co., Inc., 7112 S. Victoria, Los Angeles 45, Calif., has published an eight-page catalog on TAC Open End Ratchet-Wrenches—socket type and crowfoot type. Prices for all available sets and components are shown on a special price list furnished with the catalog, which includes complete information on features, applications, and sizes of the wrenches.

Utility Press for "shearing-in" punches and dies, separating punch and die holders on larger liner pin die sets, assembling and aligning punches and dies, and various other operations are illustrated and described in a four-page two-color bulletin (TE4-101) available from The Product Machine Co., 910 Housatonic Ave., Bridgeport 1, Conn. The bulletin also includes complete specifications of the press, which is designed to exert a pressure up to 50 tons.

Designer's Guide for Welded Construction. As an aid to the use of proper welding symbols for simplifying drafting problems, The Lincoln Electric Co., Cleveland 1, Ohio, has prepared a folder containing a condensed summary of all of the welding symbols standardized and adopted by the American Welding Society for denoting the type of weld to be applied to a particular weldment. Also included in the folder are specification tables on the different types of electrodes and additional suggestions for planning better welded designs.

"End Mills for all Purposes" is the title of a 60-page pocket-size booklet published by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn., which contains listings for over 500 types and sizes of end mills and related tools, including a number of new items such as "Hi-Helix" heavy duty end mills with Weldon shanks, diesinking cutters with spiral flutes, and tang and drawbar type end mill holders for Weldon shanks with Brown & Sharpe and Morse taper shanks. Also contained in the booklet is a section on end mill technical data which includes terminology, tips, and reference material on feeds, speeds, etc.

Offers the Solution!

... YOU CAN NOW GRIND GAGES FOR JET BLADES FAST, TO EXACT TOLERANCES, and Repetitively!

Grind your gages in gangs, holding each tolerance closely, and forming them exactly one after another! That's how Visual-Grind helps to manufacture turbo-jet blades fast and accurately with huge savings in time and money. Exact repetition in grinding curves. Continuous reference to magnified image on screen. Precision optical system for trueness and definition. Rigidity, long life. Investigate NOW!

Ask for Bulletin S-12

THE CLEVELAND GRINDING MACHINE CO.
1643 EDDY ROAD • CLEVELAND 12, OHIO

Air Tools for the foundry, steel mill, production line, and assembly plant are covered in a 44-page three-color bulletin (No. 38) published by The Rotor Tool Co., Cleveland 12, Ohio. The bulletin includes illustrations, together with application views, specifications, and descriptions, of a complete line of air tools, such as screw drivers, nut setters, sanders, drills, grinders, rammers, chippers, and scalers, as well as various tool accessories.

Special Size Castings. A six-page two-color profusely illustrated folder describing a specialized round casting service is now available from Pyott Foundry & Machine Co., 333 N. Sangamon St., Chicago 7, Ill. Castings covered by this service include pulleys, flywheels, sheaves, gear blanks, and other items.

Toolroom Lathe. Bulletin 5112 now being distributed by South Bend Lathe Works, South Bend 22, Ind., illustrates and describes the features and advantages of the South Bend 13-Inch Toolroom Lathe with underneath motor drive unit and various other efficient design details.

Contact Wheel. The Carborundum Co., Niagara Falls, N. Y., is distributing a four-page two-color illustrated folder containing performance data and information as to the features, advantages, and prices relative to its "61" Contact Wheel which is said to provide for increased belt life.

Swiss Milling Machines. A 20-page booklet fully describing multi-purpose Swiss high precision milling machines for single jobs, production work, and toolmaking is now available from Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y. Setups for many different applications are illustrated in color.

Vertical Boring and Turning Machines. A series of two-color fully illustrated catalogs containing complete descriptions and specifications of King Vertical Boring and Turning Machines has been announced by American Steel Foundries, King Machine Tool Division, Cincinnati 29, Ohio. Catalog K-1 covers 30, 36, and 42-inch machines; Catalog K-2, 52, 62, and 72-inch machines; Catalog K-3, 84 and 100-inch machines; and Catalog K-4, 120 and 144-inch machines.

Live Center. Bulletin No. RG-31 issued by Royal Products, 89 Union St., Mineola, N. Y., contains technical data on the Regent Live Center with free-turning point and designed exclusively for light duty and precision small parts production jobs.

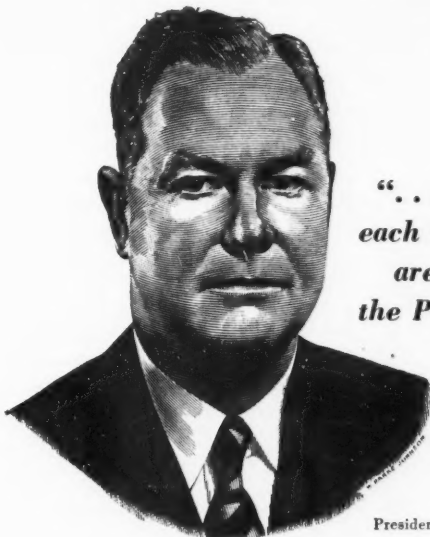
Carbide Rods and Bushings. Adamas Carbide Corp., Harrison, N. J., has prepared a comprehensive bulletin (No. B-151) detailing full information for users of tungsten carbide rods and bushings. Designed for insertion in a ring binder, the bulletin includes gram weight tables, standard tolerances for unground pieces, extra charges for special forming operations, and other useful data. Illustrations and examples show clearly how to use all of this information.

Milling, Boring, and Grinding Unit. Versa-Mill Co., 30 Church St., New York 7, N. Y., has published a 22-page bulletin (No. 8) on its Versa-Mil Precision Milling, Boring, and Grinding Unit which can be combined with machine tools or work-holding fixtures for use in production machining and in maintenance and experimental shops. Illustrations of appliances, detailed descriptions, specifications, and performance data are included in the bulletin.

Scientific Instruments. A 20-page two-color catalog published by Bausch & Lomb Optical Co., Rochester, N. Y., illustrates and describes the Balphot Metallograph with four types of illumination and Magna-Viewer projection screen for the quick determination of the crystalline structure, composition, grain size, and non-metallic inclusion content of metals.

Die Rubber. E. A. Baumbach Mfg. Co., 1806 S. Kilbourn Ave., Chicago 23, Ill., is distributing a folder containing illustrated, descriptive, and tabular information on rubber for deep drawing, bulging, knock-out, and pressure pad for punch presses or other machines.

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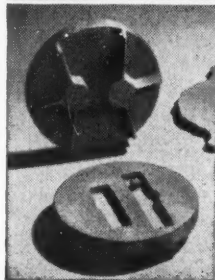
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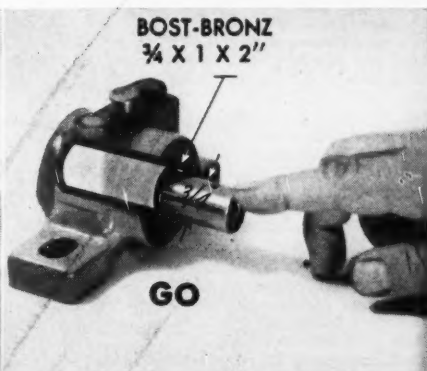
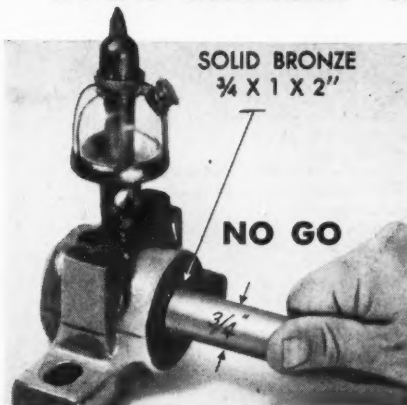
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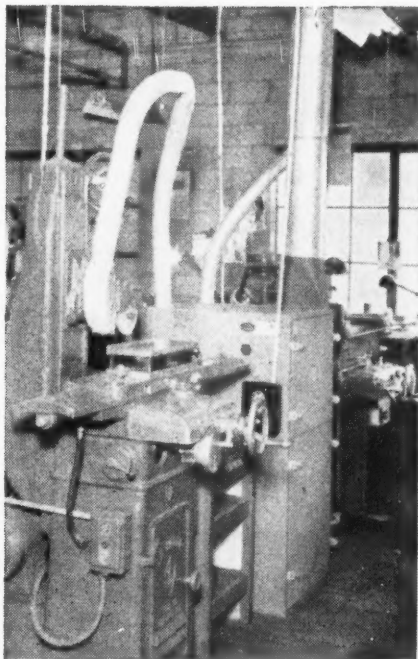
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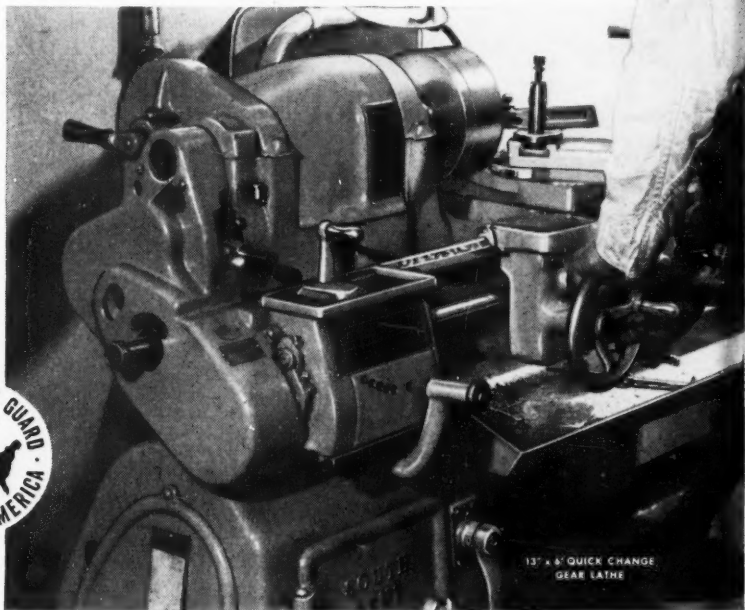
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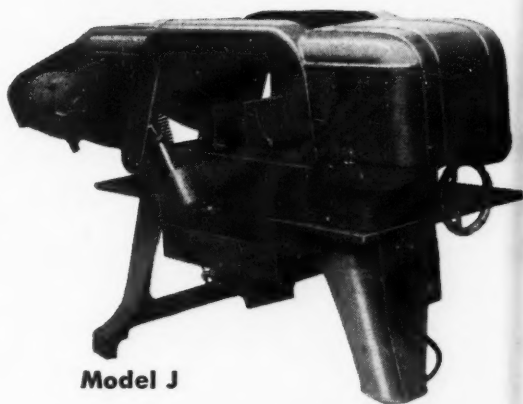
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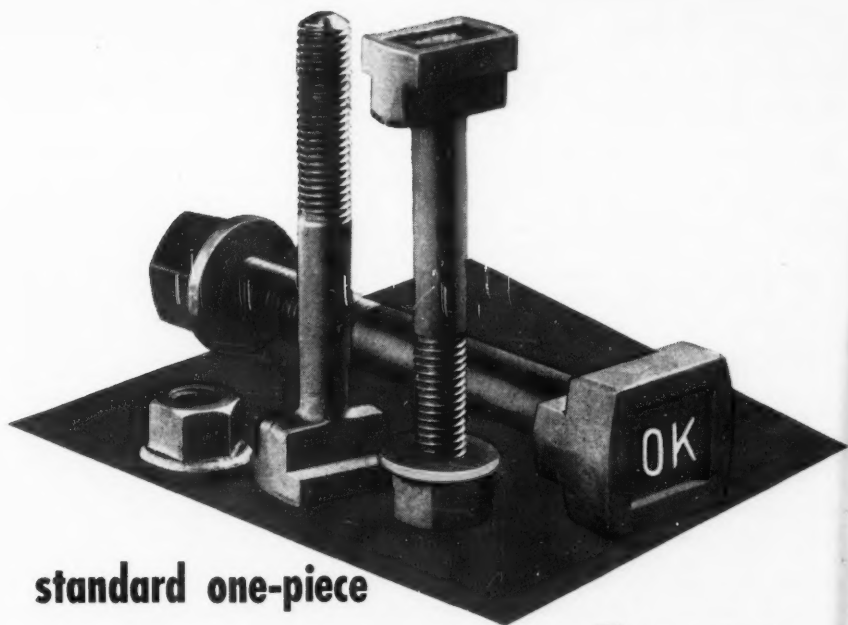
Model J, pictured, 10" x 18" Capacity, available as a wet or dry cutting machine. Also Junior Model B, (with or without casters) 5" x 10" Capacity.

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T-slot bolts must fit square and stay tight in the tables of planers, shapers, boring mills, milling machines, etc., or the table slot may be ruined.

OK T-slot bolts are built to fit all standard machine tables. They are forged — not welded — of one piece of special mild carbon steel and heat treated for maximum strength. The heads are milled accurately to size and the specially designed flange nut saves hunting for missing washers.

OK T-slot bolts come in any length from 2 inches up to 30 inches. Larger sizes made to order. Prices on application.

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COMPLETE WITH FLANGED NUT

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2	.92	.98
2 1/2	.92	.98
3	.94	1.01	1.24	1.44
3 1/2	.98	1.06	1.29	1.44
4	.98	1.06	1.29	1.44
5	1.06	1.10	1.33	1.44
6	1.06	1.16	1.38	1.52
7	1.20	1.20	1.42	1.82
8	1.29	1.29	1.52	1.82
9	1.36	1.36	1.58	1.89
10	1.36	1.36	1.58	1.89
12	1.44	1.44	1.66	1.89
14	1.58	1.82	2.05
16	1.74	1.97	2.19



the OK TOOL Co. inc. Milford, New Hampshire

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Over The Editor's Desk

Metal Shortages

AUTHORITATIVE sources of information tell us that the shortages of the critical materials such as steel, copper and aluminum will confront manufacturers for a long time to come. Even with the application of the Controlled Materials Plan there just won't be a sufficient amount of materials available to meet the full requirements of the combined civilian and military production programs. Prior to the present fourth quarter, the needs of manufacturing industries for steel alone had been placed at 223 per cent of the anticipated supply with an almost comparable demand for aluminum and copper.

From all reports coming across our desk during the past few weeks, the short range predictions indicate that the peak demand for materials for our expanding military program will not be reached until sometime during the middle of next year. Obviously, such predictions are based on the premise that we will not have become engaged in a full scale war by that time and that military production will be increased in a somewhat orderly fashion.

Of the three critical materials—steel, aluminum and copper—the experts tell us that relief will come first to the users of aluminum, with steel and copper following. More emphasis, it seems, is being placed on the expansion of our aluminum producing facilities than on steel and copper. The resulting greater aluminum production would therefore suggest, as a factor to be considered in long range planning, that wider use of aluminum in products presently being manufactured from either steel or copper should be considered.

In the field of machine tool production, manufacturers have been informed that the requirements for machine tools will necessitate an increase in production of 400 to 500 per cent. In order to obtain this enormous increase in output it is obvious that machine tool builders will be forced to make use of the facilities of other manufacturers who might also be capable of building machine tools or parts. To this end, several well-known machine tool builders have already effected contracts for the additional production required.

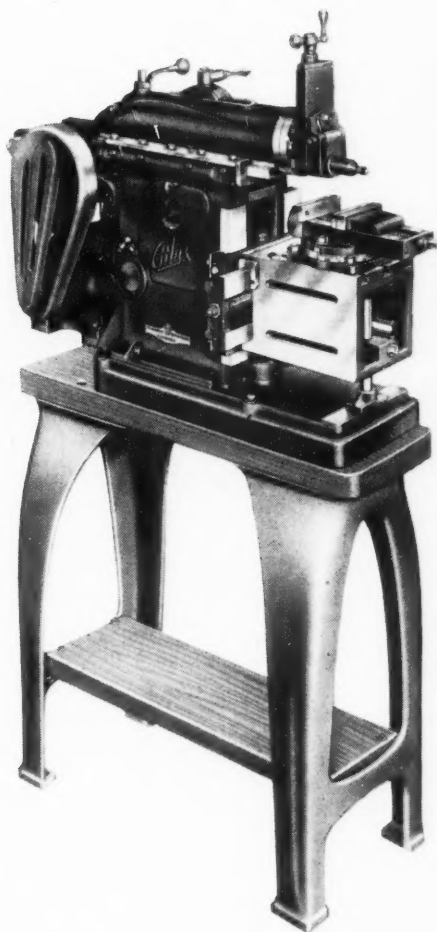
Another means of alleviating the critical tool shortage has been suggested. Briefly, because a given part can oftentimes be built by various methods in which machine tools of various kinds and types may be utilized, defense contractors have been requested to screen their machine tool requirements more closely. If a simple tool can be adapted to do a certain job, it is emphasized that users should refrain from requesting a complex tool, particularly if the complex tool happens to be in short supply.

During the present expansion program we can't possibly avoid having shortages of one kind or another. Our biggest problem is to learn to live with them while they are with us. The experience with shortages gained during World War II has been of help in many instances but cannot be relied upon too much in the present dual-purpose program.

Individual initiative may still be the key to the solution of the critical materials and tools problem.

Fred W Vogel

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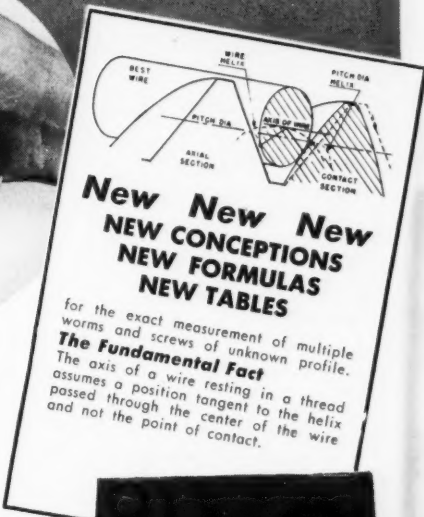
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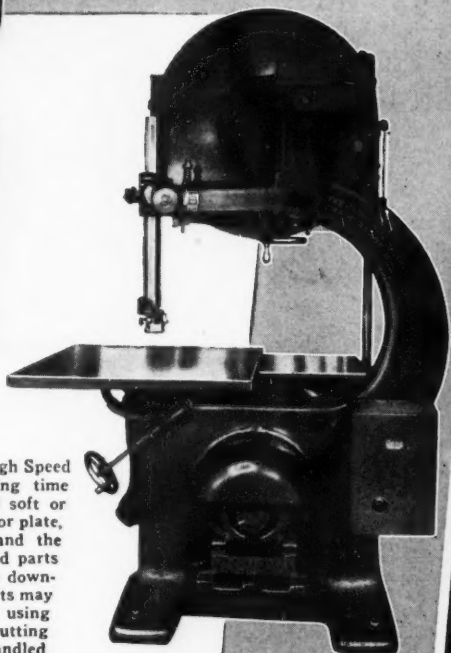


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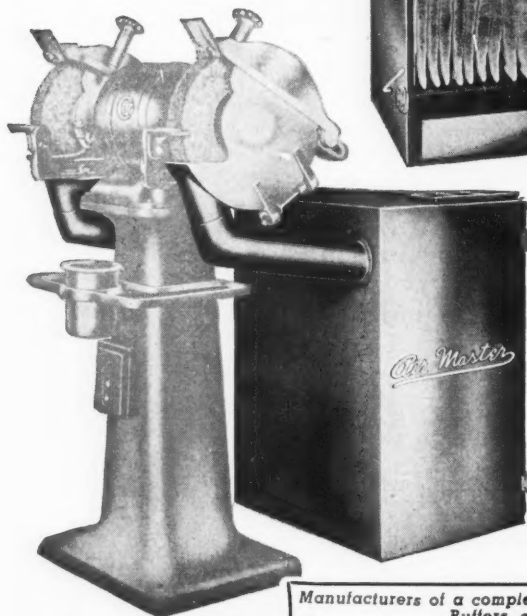
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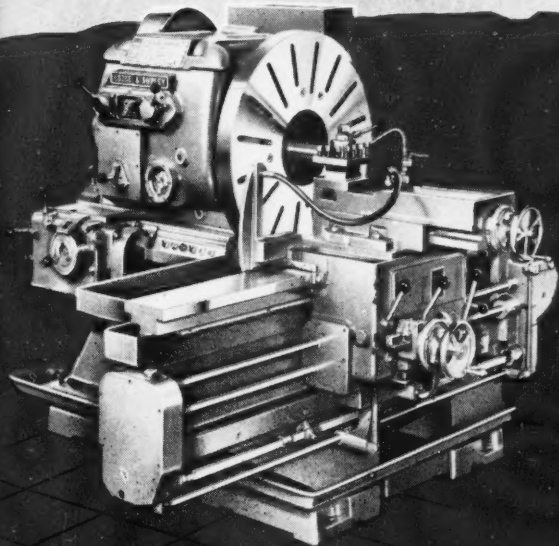
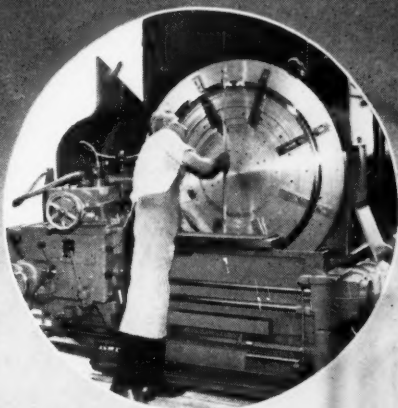
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- Saves 50% or more in floor space
- Makes large, cumbersome engine and raised lathes obsolete



In a few short months, "T-turning" and the lathe that made it possible have gained the acceptance of "show-me" tooling and engineering men, government machine tool experts, and others.

The radically new Lodge & Shipley T Lathe has solved the problem of facing, turning and boring thin-wall section work of large diameter and short length for jet engine components.

The bed is in the shape of a "T" — the carriage operates at right angles to the centerline of the lathe bed.

For faster, more sensitive, and much more accessible, the T Lathe is faster, as compact, costs far less than oversize lathes or vertical boring mills formerly used.

With priority preference, you may get early delivery out of a pool order.

Write for detailed literature.

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MACHINE TOOL DIVISION • 3053 COLERAIN

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IS THIS *YOUR* FASTENING PROBLEM?

HK *Internal Wrenching solved it!*

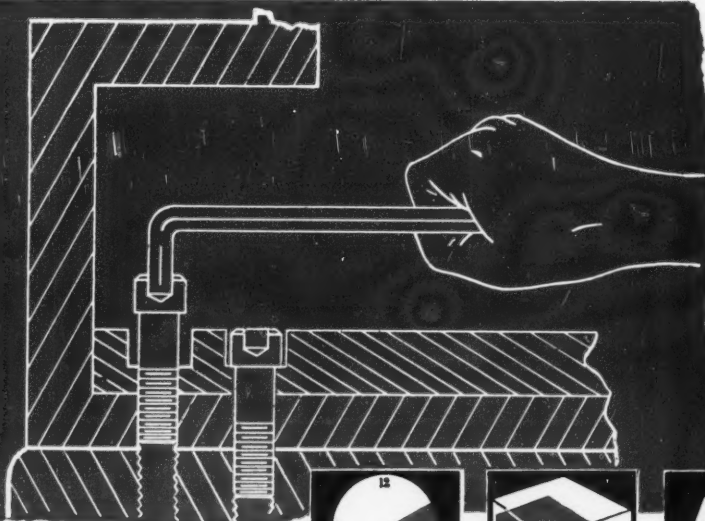
The Problem

- Fastening point located at extreme depth of recessed area. Normally inaccessible for hand application of fastener.
- Overhang and location of fastening point prohibited use of straight-drive or external-grip wrenching tools.
- Vibration and machine operation required fastener with maximum resistance to fatigue and deformation under repeated tightening and loosening.

The Solution

Holo-Krome Socket Screws — with internal wrenching — solved this unusual and difficult assembly problem . . . *quickly, efficiently, economically.*

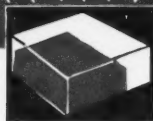
If you have a fastening problem — need a screw fastener which permits the greatest freedom for creative designing . . . USE HOLO-KROME



Holo-Krome Authorized Industrial Distributors help solve your fastening problems. Make use of their knowledge and warehouse stocks.



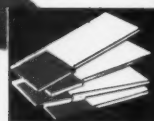
Saves TIME



Saves SPACE



Saves WEIGHT



Saves MATERIAL

H-K Socket Screws are *Completely Cold Forged* from alloy steel by an exclusive, patented Holo-Krome process which retains the uncut, uninterrupted fibre structure.

Every step of H-K production is controlled and checked by metallurgists and technicians in Holo-Krome's own Physical and Chemical Laboratories.

H-K *Completely Cold Forged* Socket Screws . . . scientifically heat treated — held to Class 3 Thread Fit — individually hand inspected . . . support and justify the Holo-Krome Guarantee of Unfailing Performance.



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SOCKET SCREWS

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